

SUMMER 1980

Vol. 2, No. 3

32
BONUS PAGES
(100 PAGES OF HEINLEIN!)

Destinies

Edited by JAMES BAEN

THE SCIENCE FICTION MAGAZINE

FEATURING:

**ROBERT A.
HEINLEIN**

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MAJOR EXCERPTS FROM
HIS NEWEST BOOK!

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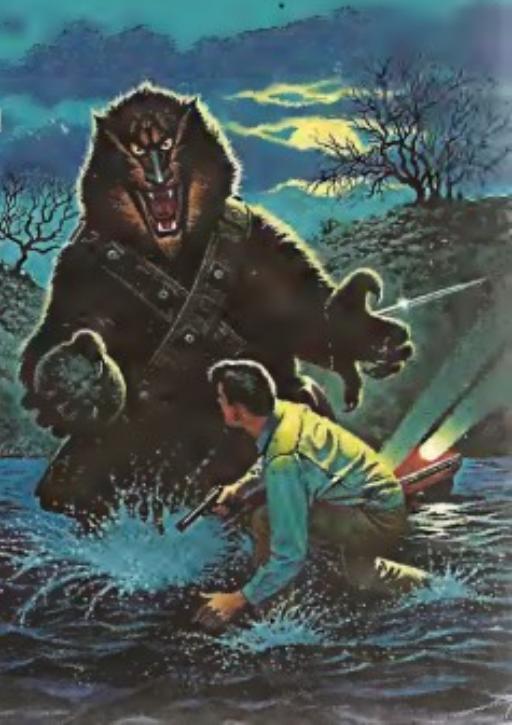
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DESTINIES THE SCIENCE FICTION MAGAZINE
SUMMER 1980

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THIS IS IT: THE HEINLEIN ISSUE

Welcome to this the Summer 1980 edition of *DESTINIES*, "The Heinlein Issue." That it contains nearly thirty thousand words by Mr. Heinlein, mostly in his own voice (as opposed to the voices of fictional characters) would be reason enough to call it that, but there is (as the saying goes) much, much more:

Spider Robinson contributes an essay on the wit and wisdom of R.A.H., which when delivered as Guest of Honor speech at the Northeast Regional SF Convention drew a standing ovation. (The article was commissioned for publication in *DESTINIES*.) As a bonus Spider plays us out with a song: Old Man Heinlein (He Just Keep Speculatin' Along).

But that's not all. One of the excerpts from *Expanded Universe*, "How to Be a Survivor," inspired us to commission a series by Dean Ing on nuclear survival. Part One, "Gimme Shelter!" assumes you have lots of time and motivation. After explaining why we are more vulnerable to a Soviet blitz than ever before, Dean shows step by step how to survive anything short of a direct hit. The next instalment, "Living Under Pressure," assumes you've ignored

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Destinies

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DESTINIES

**The Paperback Magazine of
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Volume Two, Number Three

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all the good advice in Part One: You are down wind from a strike and must build a shelter from common domestic materials—plastic bags, toilet paper, tape, cardboard boxes, etc. You've got four hours—go!

Also apropos to this Heinlein Issue is Charles Sheffield's "The Man who Stole the Moon." Mr. Heinlein's man, who *sold* the moon, was a light-hearted con artist—but serious times like these call for serious measures.

Is that all? It is not. To get everything in we had to expand to 352 pages, but it was worth it. How else could we have given you, in addition to all of the above, a novella by Dean Ing (cover story), as well as stories and articles by Larry Niven and Stephen Barnes, Jerry Pournelle (risqué space-wear of the future) Norman Spinrad, and Frederik Pohl. Plus "The L-5 Review" and a story by an unknown that is one of the best things you will read this year.

Which brings us to the next issue. The Fall edition will feature an 80-page examination of the condition and future of our country by Robert Heinlein. It's called, in blackest humor, "The Happy Days Ahead." A subscription blank is located directly to your left.

ROBERT A. HEINLEIN: A SERMON



by Spider Robinson

Rah, Rah, R.A.H.!

A swarm of petulant blind men are gathered around an elephant, searching him inch by inch for something at which to sneer. What they resent is not so much that he towers over them, and can see farther than they can imagine. Nor is it that he has been trying for nearly half a century to warn them of the tigers approaching through the distant grasses downwind. They do resent these things, but what they really, bitterly resent is his damnable contention that they are not blind, his insistent claim that they can open up their eyes any time they acquire the courage to do so.

Unforgivable.

How shall we repay our debt to Robert Anson Heinlein?

I am tempted to say that it can't be done. The sheer size of the debt is staggering. He virtually invented modern science fiction, and did not attempt to patent it. He opened up a great many of sf's frontiers, produced the first reliable maps of most of its principal territories, and did not complain when each of those frontiers filled up with hordes of johnny-come-latelies, who the moment they got off the boat began to complain about the climate, the scenery and the employment opportunities. I don't believe there can be more than a handful of science fiction stories published in the last forty years that do not show his influence one way or another. He has written the definitive time-travel stories ("All You Zombies—" and "By His Bootstraps"), the definitive longevity books (*Methuselah's Children* and *Time Enough for Love*), the definitive theocracy novel (*Revolt in 2100*),





heroic fantasy/sf novel (*Glory Road*), revolution novel (*The Moon Is a Harsh Mistress*), transplant novel (*I Will Fear No Evil*), alien invasion novel (*The Puppet Masters*), technocracy story ("The Roads Must Roll"), arms race story ("Solution Unsatisfactory"), technodisaster story ("Blowups Happen"), and about a dozen of the finest science fiction juveniles ever published. These last alone have done more for the field than any other dozen books. And perhaps as important, he broke sf out of the pulps, opened up "respectable" and lucrative markets, broached the walls of the ghetto. He continues to work for the good of the entire genre: his most recent book sale was a precedent-setting event, representing the first-ever SFWA Model Contract signing. (The Science Fiction Writers of America has drawn up a hypothetical ideal contract, from the sf writer's point of view—but until *Expanded Universe* no such contract had ever been signed.) Note that Heinlein did not do this for his own benefit: the moment the contract was signed it was renegotiated *upward*.

You can't copyright ideas; you can only copyright specific arrangements of words. If you could copyright ideas, every living sf writer would be paying a substantial royalty to Robert Heinlein.

So would a lot of other people. In his spare time Heinlein invented the waldo and the water bed (and God knows what else), and he didn't patent them either. (The firstwaldos were built by Nathan Woodruff at Brookhaven National Laboratories in 1945, three years after Heinlein described them for a few cents a word. As to the water bed, see the quotes from *Expanded Universe* which accompany this essay.) In addition he helped design the space-suit as we now know it.

Above all Heinlein is better educated, more widely read and traveled than anyone I have ever heard of, and has consistently shared the Good Parts with us.

He has learned prodigiously, and passed on the most interesting things he's learned to us, and in the process passed on some of his love of learning to us. Surely that is a mighty gift. When I was five years old he began to teach me to love learning, and to be skeptical about what I was taught, and he did the same for a great many of us, directly or indirectly.

How then shall we repay him?

Certainly not with dollars. Signet claims 11.5 million Heinlein books in print. Berkley claims 12 million. Del Rey figures are not available, but they have at least a dozen titles. His latest novel fetched a record price. Extend those figures worldwide, and it starts to look as though Heinlein is very well repaid with dollars. But consider: at today's prices you could own all 42 of his books for about a hundred dollars plus sales tax. Robert Heinlein has given me more than a C-note's worth of entertainment, knowledge and challenging skullsweat, more by several orders of magnitude. His books do not cost five times the price of Philip Roth's latest drool; hence they are drastically underpriced.

We can't repay him with awards, nor with honors, nor with prestige. He has a shelf-full of Hugos (voted by his readers), the first-ever Grand Master Nebula for Lifetime Contribution to Science Fiction (voted by his fellow writers), he is an Encyclopaedia Britannica authority, he is the only man ever to be a World Science Fiction Convention Guest of Honor three times—it's not as though he needs any more flattery.

We can't even thank him by writing to say thanks—we'd only make more work for his remarkable wife Virginia, who handles his correspondence these days. There are, as noted, millions of us (possibly hundreds of millions)—a quick thank-you apiece would cause the U.S. Snail to finally and forever collapse—and if they were actually delivered they would make it difficult for Heinlein to get any

work done.

I can think of only two things we could do to thank Robert Heinlein.

First, give blood, now and as often as you can spare a half hour and a half pint. It pleases him; blood donors have saved his life on several occasions. (Do you know the *I Will Fear No Evil* story? The plot of that book hinged on a character having a rare blood type; routine [for him] research led Heinlein to discover the National Rare Blood Club; he went out of his way to put a commercial for them in the forematter of the novel. After it was published he suffered a medical emergency, requiring transfusion. Surprise: Heinlein has a rare blood type. His life was saved by Rare Blood Club members. There is a persistent rumor, which I am unable to either verify or disprove, that at least one of those donors had joined because they read the blurb in *I Will Fear No Evil*.)

The second suggestion also has to do with helping to ensure Heinlein's personal survival—surely the sincerest form of flattery. Simply put, we can all do the best we personally can to assure that the country Robert Heinlein lives in is not ruined. I think he would take it kindly if we were all to refrain from abandoning civilization as a failed experiment that requires too much hard work. (I think he'll make out okay even if we don't—but he'd be a lot less comfortable.) I think he would be pleased if we abandoned the silly delusion that there are any passengers on Starship Earth, and took up our responsibilities as crewmen—as he has.

Which occasionally involves giving the Admiral your respectful attention. Even when the old fart's informed opinions conflict with your own ignorant prejudices.

The very size of the debt we all owe Heinlein has a lot to do with the savagery of the recent critical as-

saults on him. As Jubal Harshaw once noted, gratitude often translates as resentment. So critics, parasitic on a field which would not exist in anything like its present form or size without Heinlein, feel compelled to bite the hand that feeds them. Constitutionally unable to respect anything except insofar as it resembles themselves, the critics are naturally compelled to publicly display disrespect for a talent of which not one of them can claim the tenth part.

And some of us pay them money to do this.

Look, Robert Heinlein is not a god, not even an angel. He is "merely" a good and great man, and a good and great writer, no small achievements. But there seems to be a dark human compulsion to take the best man around, declare him a god, and then scrutinize him like a hawk for the sign of human weakness that will allow us to slay him. Something in us likes to watch the mighty topple, and most especially the good mighty. If someone wrote a book alleging that Mother Theresa once committed a venial sin, it would sell a million copies.

And some of the cracks made about Robert Heinlein have been pretty personal. Though the critics swear that their concern is with criticizing literature, few of them can resist the urge to criticize Heinlein the man.

Alexei Panshin, for instance, in *Heinlein in Dimension*, asserts as a biographical fact, without disclaimer of hearsay, that Heinlein "cannot stand to be disagreed with, even to the point of discarding friendships." I have heard this allegation quoted several times in the twelve years since Panshin committed it to print. Last week I received a review copy of Philip K. Dick's new short story collection, *The Golden Man* (Berkley); I quote from its introduction:

I consider Heinlein to be my spiritual father, even though our political ideologies are totally at variance.

Several years ago, when I was ill, Heinlein offered his help, anything he could do, and we had never met; he would phone me to cheer me up and see how I was doing. He wanted to buy me an electric typewriter, God bless him—one of the few true gentlemen in this world. *I don't agree with any ideas he puts forth in his writing, but that is neither here nor there.* One time when I owed the IRS a lot of money and couldn't raise it, Heinlein loaned the money to me. . . . he knows I'm a flipped-out freak and still he helped me and my wife when we were in trouble. That is the best in humanity, there; that is who and what I love.

(italics mine—SR)

Full disclosure here: Robert Heinlein has given me, personally, an autograph, a few gracious compliments, and a couple of hours of conversation. Directly. But when I was five he taught me, with the first and weakest of his juveniles, three essential things: to make up my own mind, always; to think it through *before* doing so; to get the facts *before* thinking. Perhaps someone else would have taught me those things sooner or later; that's irrelevant: it was Heinlein who did it. That is who and what *I* love.

Free speech gives people the right to knock who and what I love; it also gives me the right to rebut.

Not to "defend". As to the work, there it stands, invulnerable to noise made about it. As to the man, he once said that "It is impossible to insult a man who is not unsure of himself." Fleas can't bite him. Nor is there any need to defend his literary reputation; people who read what critics tell them to deserve what they get.

No, I accepted this commission because I'm personally annoyed. I grow weary of hearing someone I love slandered; I have wasted too many hours at convention parties arguing with loud nits, seen one too many alleged "reference books" take time out to criticize Heinlein's alleged political views and liter-

ary sins, heard one too many talentless writers make speeches that take potshots at the man who made it possible for them to avoid honest work. At the next convention party I want to be able to simply hand that loud nit a copy of *Destinies* and go back to having fun.

So let us consider the most common charges made against Heinlein. I arrange these in order of intelligence, with the most brainless first.

I. PERSONAL LAPSES

(Note: all these are most-brainless, as not one of the critics is in any position to know anything about Heinlein the man. The man they attack is the one they infer from his fiction: a mug's game.)

(1) "*Heinlein is a fascist.*" This is the most popular Heinlein shibboleth in fandom, particularly among the young—and, of course, exclusively among the ignorant. I seldom bother to reply, but in this instance I am being paid. Dear sir or madam: kindly go to the library, look up the dictionary definition of fascism. For good measure, read the history of fascism, asking the librarian to help you with any big words. Then read the works of Robert Heinlein, as you have plainly not done yet. If out of 42 books you can produce one shred of evidence that Heinlein—or any of his protagonists—is a fascist, I'll eat my copy of *Heinlein in Dimension*.

(2) "*Heinlein is a male chauvinist.*" This is the second most common charge these days. That's right, Heinlein populates his books with dumb, weak, incompetent women. Like Sister Maggie in "If This Goes On—"; Dr. Mary Lou Martin in "Let There Be Light"; Mary Sperling in *Methuselah's Children*; Grace Cormet in "—We Also Walk Dogs"; Longcourt Phyllis in *Beyond This Horizon*; Cynthia Craig in "The Unpleasant Profession of Jonathan Hoag"; Karen in "Gulf"; Gloria McNye in "Delilah and the Space-

Rigger"; Allucquere in *The Puppet Masters*; Hazel and Edith Stone in *The Rolling Stones*; Betty in *The Star Beast*; all the women in *Tunnel in the Sky*; Penny in *Double Star*; Pee Wee and the Mother Thing in *Have Spacesuit—Will Travel*; Jill Boardman, Becky Vesant, Patty Paiwonski, Anne, Miriam and Dorcas in *Stranger in a Strange Land*; Star, the Empress of Twenty Universes, in *Glory Road*; Wyoh, Mimi, Sidris and Gospazha Michelle Holmes in *The Moon is a Harsh Mistress*; Eunice and Joan Eunice in *I Will Fear No Evil*; Ishtar, Tamara, Minerva, Hamadryad, Dora, Helen Mayberry, Llita, Laz, Lor and Maureen Smith in *Time Enough for Love*; and Dejah Thoris, Hilda Corners, Gay Deceiver and Elizabeth Long in "*The Number of the Beast*". (An incomplete list, off the top of my head.) Brainless cupcakes all, eh? As ignorant and incompetent as Madame Curie. Helpless housewives—any one of whom could take Wonder Woman three falls out of three, and polish off Jirel of Joiry for dessert.

I think one could perhaps make an excellent case for Heinlein as a *female* chauvinist. He has repeatedly insisted that women average smarter, more practical and more courageous than men. He consistently underscores their biological and emotional superiority. He married a woman he proudly described to me as "smarter, better educated and more sensible than I am." In his latest book, *Expanded Universe*—the immediate occasion for this article—he suggests without the slightest visible trace of irony that the franchise be taken away from men and given exclusively to women (see accompanying quotes from *Expanded Universe*). He consistently created strong, intelligent, capable, independent, sexually aggressive women characters for a quarter of a century *before* it was made a requirement, right down to his supporting casts.

Clearly we are still in the area of delusions which

can be cured simply by reading Heinlein while awake.

(3) "*Heinlein is a closet fag.*" Now, this one I have only run into twice, but I include it here because of its truly awesome imbecility, and because one of those imbeciles is Thomas Disch. In a speech aptly titled, "The Embarrassments of Science Fiction," reprinted in Peter Nicholls' *Explorations of the Marvelous*, Disch asserts, with the most specious arguments imaginable, that there is an unconscious homosexual theme in *Starship Troopers*. He apparently feels (a) that everyone in the book is an obvious fag (because they all act so macho, and we all know that all macho men are really fags, right? Besides, some of them wear jewelry, as *real* men have never done in all history.), (b) that Heinlein is clearly unaware of this (because he never overtly raises the issue of the sex habits of infantry in a book intended for children and published in 1962), and (c) that (a) and (b), stipulated and taken together, would constitute some kind of successful slap at Heinlein or his book or soldiers . . . or something. Disch's sneers at "swaggering leather boys" (I can find no instance in the book of anyone wearing leather) may reveal far more about his own confusions than Heinlein's. Is homophobia the new intellectual chic?

The second imbecile was a young woman at an sf convention party, ill-smelling and as ugly as she could make herself, who insisted that *Time Enough for Love* proved that Heinlein wanted to fuck himself. I urged her to give it a try, and went to another party.

(4) "*Heinlein is right wing.*" This is not always a semantic confusion similar to the "fascist" babble cited above; occasionally the loud nit in question actually has some idea of what "right-wing" means, and is able to stretch the definition to fit a man who bitterly opposes military conscription, supports consensual sexual freedom and women's ownership of

their bellies, delights in unconventional marriage customs, champions massive expenditures for scientific research, suggests radical experiments in government, and has written with apparent approval of anarchists, communists, socialists, technocrats, limited-franchise-republicans, emperors and empresses, capitalists, dictators, thieves, whores, charlatans and even career civil servants (Mr. Kiku in *The Star Beast*). If this indeed be conservatism, then Teddy Kennedy is a liberal, and I am Marie of Roumania.

And if there were anything to the allegation, when exactly was it that the conservative viewpoint was proven wrong or declared illegal? I missed it.

(5) "*Heinlein is an authoritarian.*" To be sure, respect for law and order is one of Lazarus Long's most noticeable characteristics. Likewise Jubal Harshaw, Deety Burroughs, Fader McGee, Noisy Rhysling, John Lyle, Jim Marlowe, Wyoming Knott, Manuel Garcia O'Kelly-Davis, Prof de la Paz and Dak Broadbent. In his latest novel, '*The Number of the Beast-*', Heinlein seems to reveal himself authoritarian to the extent that he suggests a lifeboat can have only one captain at a time. He also suggests that the captain be elected, by unanimous vote.

(6) "*Heinlein is a libertarian.*" Horrors, no! How dreadful. Myself, I'm a serf.

(7) "*Heinlein is an elitist.*" Well, now. If by that you mean that he believes some people are of more value to their species than others, I'm inclined to agree—with you and with him. If you mean he believes a learned man's opinion is worth more than that of an ignoramus, again I'll go along. If by "elitist" you mean that Heinlein believes the strong should rule the weak, I strongly disagree. (Remember frail old Professor de la Paz, and Waldo, and recall that Heinlein himself was declared "permanently and totally disabled" in 1934.) If you mean he believes the

wealthy should exploit the poor, I refer you to *The Moon Is a Harsh Mistress* and *I Will Fear No Evil*. If you mean he believes the wise should rule the foolish and the competent rule the incompetent, again I plead guilty to the same offense. *Somebody's* got to drive—should it not be the best driver?

How do you pick the best driver? Well, Heinlein has given us a multiplicity of interesting and mutually exclusive suggestions; why not examine them?

(8) "*Heinlein is a militarist.*" Bearing in mind that he abhors the draft, this is indeed one of his proudest boasts. (See appended quotes.) Can there really be people so naive as to think that their way of life would survive by as much as a month the magic disappearance of their armed forces? Evidently; I meet 'em all over.

(9) "*Heinlein is a patriot.*" (Actually, they always say "superpatriot.") To them there is no other kind of patriot.) Anyone who sneers at patriotism—and continues to live in the society whose supporters he scorns—is a parasite, a fraud, or a fool. Often all three.

Patriotism does not mean that you think your country is perfect, or blameless, or even particularly likeable on balance; nor does it mean that you serve it blindly, go where it tells you to go and kill whom it tells you to kill. It means that you are committed to keeping it alive and making it better, that you will do whatever seems necessary (up to and including dying) to protect it whenever you, personally, perceive a mortal threat to it, military or otherwise. This is something to be ashamed of? I think Heinlein has made it abundantly clear that in any hypothetical showdown between species patriotism and national patriotism the former, for him, would win hands down.

(10) "*Heinlein is an atheist,*" or "*agnostic,*" or "*solipsist,*" or "*closet fundamentalist,*" or "*hedonistic Calvinist,*"

vinist," or . . . Robert Heinlein has consistently refused to discuss his personal religious beliefs; in one of his stories a character convincingly argues that it is *impossible* to do so meaningfully. Yet everyone is sure they know where he stands. *I sure don't.* The one thing I've *never* heard him called (yet) is a closet Catholic (nor am I suggesting it for a moment), but in my new anthology, *The Best of All Possible Worlds* (Ace Books), you will find a story Heinlein selected as one of his personal all-time favorites, a deeply religious tale by Anatole France (himself generally agreed to be an agnostic) called "Our Lady's Juggler," which I first heard in Our Lady of Refuge grammar school in the Bronx, so long ago that I'd forgotten it until Heinlein jogged my memory.

In any event his theology is none of anybody's damned business. God knows it's not a valid reason to criticize his fiction.

(11) "*Heinlein is opinionated.*" Of course, I can't speak for him, but I suspect he would be willing to accept this compliment. The people who offer it as an insult are always, of course, as free of opinions themselves as a newborn chicken.

Enough of personal lapses. What are the indictments that have been handed down against Heinlein's work, his failures as a science fiction writer? Again, we shall consider the most bone-headed charges first.

II. LITERARY LAPSES

(1) "*Heinlein uses slang.*" Sorry. Flat wrong. It is very seldom that one of his *characters* uses slang or argot; he in auctorial voice never does. What he uses that is *mislabelled* "slang" is idiom and colloquialism. I won't argue the (to me self-evident) point that a writer is *supposed* to preserve them—not at this time, anyway. I'll simply note that you can't very well

criticize a man's use of a language you can't use properly yourself.

(2) "*Heinlein can't create believable women characters.*" There's an easy way to support this claim: simply disbelieve in all Heinlein's female characters, and maintain that all those who believe them are gullible. You'll have a few problems, though: several of Heinlein's women bear a striking resemblance to his wife Virginia, you'll have to disbelieve in her, too—which could get you killed if your paths cross. Also, there's a lady I once lived with for a long time, who used to haunt the magazine stores when *I Will Fear No Evil* was being serialized in *Galaxy*, because she could not wait to read the further adventures of the "unbelievable" character with whom she identified so strongly—you'll have to disbelieve in her, too.

Oddly, this complaint comes most often from radical feminists. Examination shows that Heinlein's female characters are almost invariably highly intelligent, educated, competent, practical, resourceful, courageous, independent, sexually aggressive and sufficiently personally secure to be able to stroke their men's egos as often as their own get stroked. I will—reluctantly—concede that this does *not* sound like the average woman as I have known her, but I am bemused to find myself in the position of trying to convince *feminists* that such women can in fact exist.

I think I know what enrages the radicals: two universal characteristics of Heinlein heroines that I left out of the above list. They are always beautiful and proud of it (regardless of whether they happen to be pretty), and they are always strongly interested in having babies. *None* of them bitterly regrets and resents having been born female—which of course makes them not only traitors to their exploited sex, but unbelievable.

(3) "*Heinlein's male characters are all him.*" I understand this notion was first put forward by James

Blish in an essay titled, "Heinlein, Son of Heinlein," which I have not seen. But the notion has been taken up by a great many critics. As they see it, there are three basic male personae Heinlein uses over and over again, the so-called Three-Stage Heinlein Individual. The first and youngest stage is the bright but naive youth; the second is the middle-aged man who knows how the world works; the third is the old man who knows how it works and why it works, knows how it got that way. All three, the critics assert, are really Heinlein in the thinnest of disguises. (Sounds like the average intelligent man to me.)

No one ever does explain what, if anything, is wrong with this, but the implication seems to be that Heinlein is unable to get into the head of anyone who does not think like him. An interesting theory—if you overlook Dr. Ftaeml, Dr. Mahmoud, Memtok, David McKinnon, Andy Libby, all the characters in "Magic, Inc." and "And He Built a Crooked House," Noisy Rhysling, the couple in "It's Great to Be Back," Lorenzo Smythe, The Man Who Traveled in Elephants, Bill Lermer, Hugh Farnham, Jake Salomon, all the extremely aged characters in *Time Enough for Love*, all the extremely young characters in *Tunnel in the Sky* except Rod Walker, and all four protagonists of "*The Number of the Beast*"—(among many others. Major characters all, and none of them fits on the three-stage age/wisdom chart. (Neither, by the way, does Heinlein—who was displaying third-stage wisdom and insight in his early thirties.)

If all the male Heinlein characters that can be forced into those three pigeonholes are Heinlein in thin disguise, why is it that I have no slightest difficulty in distinguishing (say) Juan Rico from Thorby, or Rufo from Dak Broadbent, or Waldo from Andy Libby, or Jubal Harshaw from Johann Smith? If Heinlein writes in characterizational monotone, why don't I confuse Colonel Dubois, Colonel Baslim and

Colonel Manning? Which of the four protagonists of "*The Number of the Beast*" is the *real* Heinlein, and how do you know?

To be sure, some generalizations can be made of the majority of Heinlein's heros—he seems fascinated by competence, for example, whereas writers like Pohl and Sheckley seem fascinated by incompetence. Is this a flaw in *any* of these three writers? If habitual use of a certain type of character is a literary sin, should we not apply the same standard to Alfred Bester, Kurt Vonnegut, Phil Dick, Larry Niven, John Irving, Philip Roth, Raymond Chandler, P.G. Wodehouse, J.P. Donleavy and a thousand others?

(4) "*Heinlein doesn't describe his protagonists physically.*" After I have rattled off from memory complete physical descriptions of Lazarus and Dora and Minerva Long, Scar Gordon, Jubal Harshaw and Eunice Branca, complainers of this type usually add, "unless the mechanics of the story require it." Thus amended, I'll chop it—as evidence of the subtlety of Heinlein's genius.

What these types are usually complaining about is the absence of any *poetry* about physical appearance, stuff like, "Questing eyes shaped precisely like dwarf hazelnuts brooded above a strong yet amiable nose, from which depended twin parentheses framing a mouth like a pink Eskimo Pie. Magenta was his wes-kit, and his hair was the color of mild abstraction on a winter's morning in Antigonish." Given a choice between displaying my descriptive skills and allowing *all* my readers to identify with my characters, I know which I'll pick.

But I have to admit that Alexei Panshin put his finger on the fly in the ointment on P. 128 of *Heinlein in Dimension*: ". . . while the reader doesn't notice the lack of description while he reads, afterwards individual characters aren't likely to stand out in the mind." In other words, if you leave anything to the

reader's imagination, you've lost better than half the critics right there. Which may be the best thing to do with them.

(5) "*Heinlein can't plot.*" One of my favorite parts of *Heinlein in Dimension* (he doesn't say which dimension, but it can't be any of the five I use) is the section on plot. On P. 153 Panshin argues that Heinlein's earliest works are flawed because "they aren't told crisply. They begin with an end in mind and eventually get there, but the route they take is a wandering one." On the *very next page* Panshin criticizes Heinlein's later work for *not* wandering, for telling him only those details necessary to the story.

In "Gulf," for instance, Heinlein spends one day in time and 36 pages in enrolling an agent. He then spends six months, skimmed over in another 30-odd pages, in training the agent. Then, just to end the story, he kills his agent off in a job that takes him one day, buzzed over in a mere 4 pages. The gradual loss of control is obvious.

Presumably the significant and interesting parts of Panshin's life come at steady, average speed. Or else he wanted the boring and irrelevant parts of Joe's life thrown in to balance some imaginary set of scales. (Oh, and just to set the record straight, it is clearly stated in "Gulf" that Joe's final mission takes him many days.)

All written criticism I have seen of Heinlein's plotting comes down to this same outraged plaint: that if you sit down and make an outline of the sequence of events in a Heinlein story, it will most likely not come out symmetrical and balanced. Right you are: it won't. It will just *seem* to sort of ramble along, just like life does, and at the end, when you have reached the place where the author wanted you to go, you will look back at your tracks and fail to discern in them any mathematical pattern or regular geometric

shape. If you keep looking, though, you'll notice that they got you there in the shortest possible distance, as straightforwardly as the terrain allowed. And that you hurried.

That they cannot be described by any simple equation is a sign of Heinlein's excellence, not his weakness.

(6) "*Heinlein can't write sex scenes.*" This one usually kicks off an entertaining hour defining a "good sex scene." Everybody disagrees with everybody on this, but most people I talk to can live with the following four requirements: a "good" sex scene should be believable, consensual (all parties consenting), a natural development of the story rather than a pasted-on attention-getter, and, hopefully, sexually arousing.

In order: Heinlein has never described *any* sexual activity that would cause either Masters or Johnson even mild surprise. In forty-two books I can recall only one scene of even attempted rape (unsuccessful, fatally so) and two depictions of extremely mild spanking. I have found *no* instances of gratuitous sex, tacked on to make a dull story interesting, and I defy anyone to name one.

As to the last point, if you have spent any time at all in a pornshop (and if you haven't, why not? Aren't you at all curious about people?) you'll have noticed that *none* of the clientele is aroused by more than 5-10% of the available material. Yet it all sells or it wouldn't be there. One man's meat is another man's person. Heinlein's characters may not behave in bed the way you do—so what?

It has been argued by many, including Panshin, that "Heinlein almost completely ignored sex for years, mentioning it only when he had to and then obliquely, and then . . . became obsessed by it." They complain that all of Heinlein's early heros, at least, are Boy Scouts. Please examine any reasonably

complete bibliography of early Heinlein—the one in the back of *Heinlein in Dimension* will do fine. Now: if you exclude from consideration (a) juvenile novels, in which Heinlein *could not* have written a sex scene, any more than any juveniles-novelist could have in the forties and fifties; (b) stories sold to John Campbell, from which Kay Tarrant cut all sex no matter who the author; (c) stories aimed at and sold to "respectable," slick, non-sf markets which were already breaking enough taboos by buying science fiction at all; (d) tales in which no sex subplot was appropriate to the story; and (e) stories for *Boy's Life* whose protagonists were *supposed* to be Boy Scouts; what you are left with as of 1961 is two novels and two short stories, all rife with sex. Don't take my word, go look it up. In 1961, with the publication of *Stranger in a Strange Land*, Heinlein became one of the first sf writers to openly discuss sex at any length, and he has continued to do so since. (Note to historians: I know Farmer's "The Lovers" came nine years earlier—but note that that story did not appear in book form until 1961, the same year as *Stranger* and a year after Sturgeon's *Venus Plus X*.) I know vanishingly few septuagenarians whose view of sex is half so liberal and enlightened as Heinlein's—damn few people of *any* age, more's the pity.

(7) "*Heinlein is preachy.*" "preachy: inclined to preach." "preach: to expound upon in writing or speech; especially, to urge acceptance of or compliance with (specified religious or moral principles)."

Look: the classic task of fiction is to create a character or characters, give he-she-or-them a problem or problems, and then show his-her-their struggle to find a solution or solutions. If it doesn't do that it isn't fiction, it's an aesthetic arrangement of words, and comparatively few people will pay cash for the privilege of reading it. (Rail if you will about "archaic

rules stifling creative freedom": that's the way readers are wired up, and we exist for *their* benefit.) Now: if the solution proposed does not involve a moral principle (extremely difficult to pull off), you have a cook-book, a how-to manual, Spaceship Repair for the Compleat Idiot. If no optimal solution is suggested, if the problem is left unsolved, there are three possibilities: either the writer is propounding the *moral principle* that some problems have no optimal solutions (e.g. "Solution Unsatisfactory" by RAH), or the writer is suggesting that *somebody* should find a solution to this dilemma because it beats the hell out of him, or the writer has simply been telling you a series of pointless and depressing anecdotes, speaking at great length without saying anything (e.g. most of modern mainstream litracha). Perhaps this last is an enviable skill, for a politician, say, but is it really a requirement of good fiction?

Exclude the above cases and what you have left is the majority of all the fiction ever written, and the overwhelming majority of the good fiction.

But one of the oddities of humans is that while we all want our fiction to propose solutions to moral dilemmas, we do not want to admit it. Our writers are *supposed* to answer the question, "What is moral behavior?"—but they'd better not let us catch them palming that card. (Actually, Orson and I are just good friends.) The pill must be heavily sugar-coated if we are to swallow it. (I am not putting down people. *I'm* a people. That bald apes can be cajoled into mortal speculation by any means at all is a miracle, God's blessing on us all. Literature is the antithesis of authoritarianism and organized religion—which seek to replace moral speculation with laws—and in that cause we should all be happy to plunge our arms up to the shoulders in sugar.)

And so, when I've finished explaining that "preachy" is a *complimentary* thing to call a writer,

the people who made the charge usually backpeddle and say that what they *meant* was

(8) "*Heinlein lectures at the expense of his fiction.*" Here, at last, we come to something a little more than noise. This, if proved, would seem a genuine and serious literary indictment.

Robert Heinlein himself said in 1950:

A science fiction writer may have, and often does have, other motivations *in addition to* pursuit of profit. He may wish to create "art for art's sake," he may want to warn the world against a course he feels disastrous (Orwell's *1984*, Huxley's *Brave New World*—but please note that each is intensely entertaining, and that each made stacks of money), he may wish to urge the human race toward a course which he considers desirable (Bellamy's *Looking Backwards*, Wells' *Men Like Gods*), he may wish to instruct, to uplift, or even to dazzle. But the science fiction writer—any fiction writer—must keep entertainment consciously in mind as his prime purpose . . . or he may find himself back dragging that old cotton sack.

(from "Pandora's Box," *Expanded Universe*)

The charge is that in his most recent works, Robert Heinlein has subordinated entertainment to preaching, that he has, as Theodore Sturgeon once said of H.G. Wells' later work, "sold his birthright for a pot of message." In evidence the prosecution adduces *I Will Fear No Evil*, *Time Enough for Love*, the second and third most recent Heinlein novels, and when "*The Number of the Beast*—" becomes generally available, they'll probably add that one too.

Look: nobody wants to be lectured to, right? That is, no one wants to be lectured to by some jerk who doesn't know any more than they do. But do not good people, responsible people, enlightened citizens, *want* to be lectured to by someone who knows more than they do? Have we really been following Heinlein

for forty years because he does great card tricks? Only?

Defense is willing to stipulate that, proportionately speaking, all three of People's Exhibits tend to be—*by comparison with early Heinlein*—rather long on talk and short on action (*Time Enough for Love* perhaps least so of the three). Defense wishes to know, however, what if anything is wrong with that, and offers for consideration *Venus Plus X*, *Triton*, *Camp Concentration* and Alexei Panshin's *The Thurb Revolution*.

I Will Fear No Evil concerns a man whose brain is transplanted into the body of a healthy and horny woman; to his shock, he learns that the body's original personality, its soul, is still present in his new skull (or perhaps, as Heinlein is careful not to rule out, he has a sustained and complex hallucination to that effect). She teaches him about how to be female, and in the process learns something of what it's like to be male. Is there any conceivable way to handle this theme *without* lots of internal dialogue, lots of sharing of opinions and experiences, and a minimum of fast-paced action? Or is the theme itself somehow illegitimate for sf?

Time Enough for Love concerns the oldest man in the Galaxy (by a wide margin), who has lived so long that he no longer longs to live. But his descendants (and by inescapable mathematical logic most of the humans living by that point *are* his descendants) will not let him die, and seek to restore his zest for living by three perfectly reasonable means: they encourage him to talk about the Old Days, they find him something new to do, and they smother him with love and respect. Do not all of these involve a lot of conversation? As I mentioned above, this book *has* action aplenty, when Lazarus gets around to reminiscing (and lying); that attempted-rape scene, for instance, is a small masterpiece, almost a textbook course in how to handle a fight scene.

But who says that ideas are not as entertaining as fast-paced action?

"*The Number of the Beast*—" (I know, on the cover of the book it says *The Number of the Beast*, without quotes or dash; that is the publishers' title. I prefer Heinlein's.) I hesitate to discuss this book as it is unlikely you have read it yet and I don't want to spoil any surprises (of which there are many). But I will note that there is more action here than in the last two books put together, and—since all four protagonists are extraordinarily educated people, who love to argue—a whole lot of lively and spirited dialogue. I also note that its basic premise is utterly, delightfully preposterous—and that I do not believe it can be disproved. (Maybe Heinlein and Phil Dick aren't *that* far apart after all.) It held my attention most firmly right up to the last page, and indeed holds it yet.

Let me offer some more bits of evidence.

One: According to a press release which chanced to land on my desk last week, three of Berkley Publishing Company's top ten all-time best-selling sf titles are *Stranger in a Strange Land*, *Time Enough for Love*, and *I Will Fear No Evil*.

Two: In the six years since it appeared in paperback, *Time Enough for Love* has gone through thirteen printings—a feat it took both *Stranger in a Strange Land* and *The Moon Is a Harsh Mistress* ten years apiece to achieve.

Three: Gregg Press, a highly selective publishing house which brings out quality hardcover editions of what it considers to be the finest in sf, has already printed an edition of *I Will Fear No Evil*, designed to survive a thousand readings. It is one of the youngest books on the Gregg list.

Four: *The Notebooks of Lazarus Long*, 62-page excerpt from *Time Enough for Love* comprising absolutely *nothing but opinions*, without a shred of action,

narrative or drama, is selling quite briskly in a *five-dollar paperback* edition, partially hand-lettered by D.F. Vassallo. I know of no parallel to this in all sf (unless you consider Tolkien "sf").

Five: Heinlein's latest novel, "*The Number of the Beast*"—, purchased by editors who, you can assume, knew quite well the dollars-and-cents track record of Heinlein's last few books, fetched an all-time genre-record-breaking half a million dollars.

Plainly the old man has lost his touch, eh? Mobs of customers, outraged at his failure to entertain them, are attempting to drown him in dollars.

What's that? You there in the back row, speak up. You say *you* aren't entertained, and that proves Heinlein isn't entertaining? Say, aren't *you* the same person I saw trying to convince that guy from the *New York Times* that sf is not juvenile brainless adventure but the literature of ideas? Social relevance and all that?

What that fellow in the back row means is not that ideas and opinions do not belong in a science fiction novel. He means he disagrees with some of Heinlein's opinions. (Even that isn't strictly accurate. From the noise and heat he generates in venting his disagreement, it's obvious that he hates and bitterly resents Heinlein's opinions.)

I know of many cases in which critics have disagreed with, or vilified, or forcefully attacked Robert Heinlein's opinions. A few were even able to accurately identify those opinions. I know of none who has succeeded in *disproving*, demonstrating to be false, a single one of them.

Defense's arms are weary from hauling exhibits up to the bench; perhaps this is the point at which Defense should rest.

Instead I will reverse myself, plead guilty with an explanation, and throw myself on the mercy of the court. I declare that I *do* think the sugar-coating on

Heinlein's last few books is (comparatively) thin, and not by accident or by failure of craft. I believe there is a good reason why the plots of the last three books allow and require their protagonists to preach at length. Moral, spiritual, political and historical lessons which he once would have spent at least a novelette developing are lately fired off at the approximate rate of a half dozen per conversation. That his books do not therefore fall apart the way Wells' last books did is only because Heinlein is incapable of writing dull. Over four decades it has become increasingly evident that he is not the "pure entertainment" song and dance man he has always claimed to be, that he has sermons to preach—and the customers keep coming by the carload. Furthermore, with the passing of those four decades, the urgency of his message has grown.

And so now, with his very latest publication, *Expanded Universe*, Heinlein has finally blown his cover altogether. I think that makes *Expanded Universe*, despite a significant number of flaws, the single most important and valuable Heinlein book ever published.

Let me tell you a little about the book. It is built around a previously available but long out of print Heinlein collection, *The Worlds of Robert A. Heinlein*, but it has been expanded by about 160% with approximately 125,000 words of new material, for a total of about 202,500 words. Some of the new stuff is fiction, although little of it is science fiction (about 17,500 words). But the bulk of the new material, about 84,000 words, is non-fiction. Taken together it's as close as Heinlein is ever going to get to writing his memoirs, and forms his ultimate personal statement to date. In ten essays, a polemic, one and a half speeches and extensive forewords and afterwords for most of thirteen stories, Heinlein lets us further inside his head than he ever has before. And hey, you

know what? He doesn't resemble Lazarus Long much at all.

For instance, although he is plainly capable of imagining and appreciating it, Heinlein is not himself able to sustain Lazarus's magnificent ingrained indifference to the fate of any society. Unlike Lazarus, Heinlein loves the United States of America. He'll tell you why, quite specifically, in this book. Logical, pragmatic reasons why. He will tell you, for instance, of his travels in the Soviet Union, and what he saw and heard there. If, after you've heard him out, you still don't think that for all its warts (hell, running sores), the United States is the planet's best hope for an enlightened future, there's no sense in us talking further; you'll be wanting to pack. (Hey, have you heard? The current government of the People's Republic of China [half-life unknown] has allowed as how limited freedom of thought will be permitted this year. Provisionally.) You know, the redneck clowns who chanted "America—love it or leave it!" while they stomped me back in the sixties didn't have a *bad* idea. The only problem was that they got to define "love of America," and they limited its meaning to "blind worship of America." In addition they limited the definition of America to "the man in the White House."

These mistakes Heinlein certainly does not make. (Relevant quote from *Expanded Universe*: "Brethren and Sistren, have you ever stopped to think that *there has not been one rational decision out of the Oval Office for fifty years?*"—[italics his-SR]) In this book he identifies clearly, vividly and concisely the specific brands of rot that are eating out America's heart. He outlines each of the deadly perils that face the nation, and predicts their consequences. As credentials, he offers a series of fairly specific predictions he made in 1950 for the year 2000, updated in 1965, and adds 1980 updates supporting a claim of a 66% success

rate—enormously higher than that of, say, Jeanne Dixon. He pronounces himself dismayed not only by political events of the last few decades, but by the terrifying decay of education and growth of irrationalism in America. (Aside: in my own opinion, one of the best exemplars of this latter trend is Stephen King's current runaway bestseller *The Stand*, a brilliantly entertaining parable in praise of ignorance, superstition, reliance on dreams, and the sociological insights of feeble-minded old Ned Lud.)

It is worth noting in this connection that while Heinlein has many scathing things to say about the U.S. in *Expanded Universe*, he has prohibited foreign editions. We don't wash family linen with strangers present. I don't know of any other case in which an sf writer deliberately (and drastically) limited his royalties out of patriotism, or for that matter any moral principle. I applaud.

Friends, one of the best educated and widely-traveled men in America has looked into the future, and he is not especially optimistic.

It cannot be said that he despairs. He makes *many* positive, practical suggestions—for real cures rather than Band-aids. He outlines specifically how to achieve the necessary perspective and insight to form intelligent extrapolations of world events, explains in detail how to get a decent education (by the delightful device of explaining how *not* to get one), baldly names the three pillars of wisdom, and reminds us that "Last to come out of Pandora's Box was a gleaming, beautiful thing—eternal Hope."

But the last section of the book is a matched pair of mutually exclusive prophecies, together called "The Happy Days Ahead." The first is a gloomy scenario of doom, the second an optimistic scenario. He says, "I can risk great gloom in the first because I'll play you out with music at the end."

But I have to admit that the happy scenario, *Over*

the Rainbow, strikes me as preposterously unlikely.

In fact, the only thing I can imagine that would increase its probability would be the massive widespread reading of *Expanded Universe*.

Which brings me to what I said at the beginning of this essay: if you want to thank Robert A. Heinlein, do what you can to see to it that the country he loves, the culture he loves, the magnificent ideal he loves, is not destroyed. If you have the wit to see that this old man has a genuine handle on the way the world wags, kindly stop complaining that his literary virtues are not classical and go back to doing what you used to do when sf was a ghetto-literature scorned by all the world: force copies of Heinlein on all your friends. Unlike most teachers, Heinlein has been successfully competing with television for forty years now. Anyone that *he* cannot convert to rationalism is purely unreachable, and you know, there are a hell of a lot of people on the fence these days.

I do not worship Robert Heinlein. I do not agree with everything he says. There are a number of his opinions about which I have serious reservations, and perhaps two with which I flat-out disagree (none of which I have the slightest intention of washing with strangers present). But all of these tend to keep me awake nights, because the only arguments I can assemble to refute him are based on "my thirty years of experience," of a very limited number of Americans and Canadians—and I'm painfully aware of just how poorly that stacks up against his seventy-three years of intensive study of the entire population and the entire history of the planet.

And I repeat: if there is anything that can divert the land of my birth from its current stampede into the Stone Age, it is the widespread dissemination of the thoughts and perceptions that Robert Heinlein has been selling as entertainment since 1939. You can thank him, not by buying his book, but by *loaning out*

the copy you buy to as many people as will sit still for it, until it falls apart from overreading. (Be sure and loan *Expanded Universe* only to fellow citizens.) Time is short: it is no accident that his latest novel devotes a good deal of attention to the subject of lifeboat rules. Nor that *Expanded Universe* contains a quick but thorough course in how to survive the aftermath of a nuclear attack. (When Heinlein said in his Guest of Honor speech at MidAmeriCon that "there will be nuclear war on Earth in your lifetime," some people booed, and some were unconvinced. But it chanced that there was a thunderstorm over the hotel next morning—and I woke up three feet in the air, covered with sweat.) Emergencies require emergency measures, so drastic that it will be hard to persuade people of their utter necessity.

If you want to thank Robert Heinlein, open your eyes and look around you—and begin loudly demanding that your neighbors do likewise.

Or—at the very least—please stop loudly insisting that the elephant is merely a kind of inferior snake, or tree, or large barrel of leather, or oversized harpoon, or flexible trombone, or . . .

(When I read the above as my Guest of Honor speech at the New England Science Fiction Association's annual regional convention, Bosklone, I took Heinlein's advice about playing them out with music literally, and closed with a song. I append it here as well. It is the second filksong I've ever written, and it is set to the tune of *Old Man River*, as arranged by Marty Paich on Ray Charles's *Ingredients in a Recipe for Soul*. [If you're not familiar with that arrangement, the scansion will appear to limp at the end.] Guitar chords are provided for would-be filksingers, but *copyright is reserved* for recording or publishing royalties, etc.)

—Spider Robinson

O'l Man Heinlein

(lyrics by Spider Robinson)

D G7 D G7
O'l man Heinlein That o'l man Heinlein
D A7 Bm E7
He must know somethin' His heart keeps pumpin'
A Asus A A+ D
He just keep writin' And lately writin' 'em long

D G7 D G7
He don't write for critics Cause that stuff's rotten
D A7 Bm E7
And them that writes it Is soon forgotten
A Asus A A+ D
But o'l man Heinlein keeps speculatin' along

F#m C#7 F#m C#7
You and me Sit and think
F#m C#7 F#m C#7
Heads all empty except for drink
F#m C#7 F#m C#7
Tote that pen Jog that brain

F#m C#7 F#m Em A7
Get a little check in the mail from Baen . . .

D A7 D A7
I get bleary And feel like shirkin'
D A7 Bm E7
I'm tired of writin' But scared of workin'
A Asus A A+ D
But o'l man Heinlein He keeps on rollin' along

Abm Eb7 Abm Eb7
You and me Read his stuff
Abm Eb7 Abm Eb7
Never can seem to get enough

Abm Eb7 Abm Eb7
Turn that page Dig them chops
Abm Eb7 Abm F#m B7
Hope the old gentleman never stops . . .

E A7 E A7
So raise your glasses It's only fittin'
E B C#m F#7
The best sf that was ever written
E E+ E6 Am
Is Old Man Heinlein
E C#m F#7 B7 E
May he live as long as Lazarus Long!

*The greatest epic fantasy since
LORD OF THE RINGS!*

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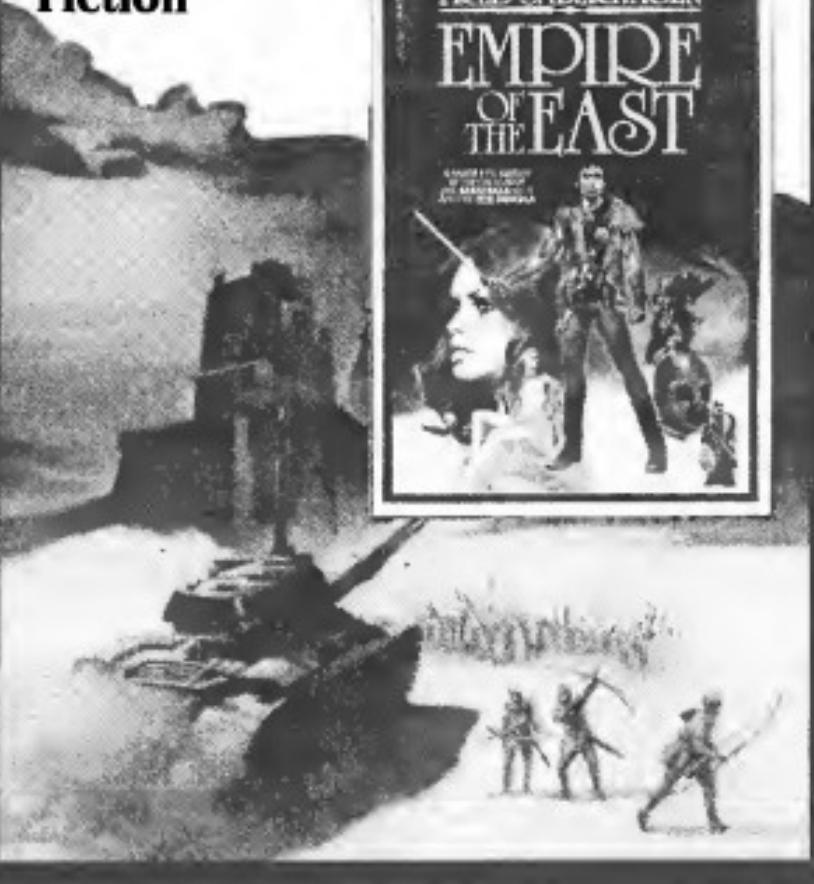
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PART ONE

THE
NEW
WORLDS
OF

ROBERT A. HEINLEIN

EXPANDED UNIVERSE

Not one but ALL of our crisis problems can be solved by exploiting space. Employment, inflation, pollution, population, energy, running out of nonrenewable resources—there is pie in the sky for the entire planet.

FOREWORD

I had always planned to quit the writing business as soon as that mortgage was paid off. I had never had any literary ambitions, no training for it, no interest in it—backed into it by accident and stuck with it to pay off debt, I being always firmly resolved to quit the silly business once I had my chart squared away.

At a meeting of the Mañana Literary Society—an amorphous disorganization having as its avowed purpose "to permit young writers to talk out their stories to each other in order to get them off their minds and thereby save themselves the trouble of writing them down"—at a gathering of this noble group I was expounding my determination to retire from writing once my bills were paid—in a few weeks, during 1940, if the tripe continued to sell.

William A. P. White ("Anthony Boucher") gave me a sour look. "Do you know any retired writers?"

"How could I? All the writers I've ever met are in this room."

"Irrelevant. You know retired school teachers, retired naval officers, retired policemen, retired farmers. Why don't you know at least one retired writer?"

"What are you driving at?"

"Robert, there are no retired writers. There are writers who have stopped selling . . . but they have not stopped writing."

I pooh-poohed Bill's remarks—possibly what he said applied to writers in general . . . but I wasn't really a writer; I was just a chap who needed money and happened to discover that pulp writing offered an easy way to grab some without stealing and without honest work. ("Honest work"—a euphemism for underpaid bodily exertion, done standing up or on your knees, often in bad weather or other nasty circumstances, and frequently involving shovels, picks, hoes, assembly lines, tractors, and unsympathetic supervisors. It has never appealed to me.

Sitting at a typewriter in a nice warm room, with no boss, cannot possibly be described as "honest work.")

BLOWUPS HAPPEN sold and I gave a mortgage-burning party. But I did not quit writing at once (24 Feb 1940) because, while I had the Old Man of the Sea (that damned mortgage) off my back, there were still some other items. I needed a new car; the house needed paint and some repairs; I wanted to make a trip to New York; and it would not hurt to have a couple of hundred extra in the bank as a cushion—and I had a dozen-odd stories in file, planned and ready to write.

So I wrote MAGIC, INCORPORATED and started east on the proceeds, and wrote THEY and SIXTH COLUMN while I was on that trip. The latter was the only story of mine ever influenced to any marked degree by John W. Campbell, Jr. He had in file an unsold story he had written some years earlier. JWC did not show me his manuscript; instead he told me the story line orally and stated that, if I would write it, he would buy it.

He needed a serial; I needed an automobile. I took the brass check.

Writing SIXTH COLUMN was a job I sweated over. I had to reslant it to remove racist aspects of the original story line. And I didn't really believe the pseudoscientific rationale of Campbell's three spectra—so I worked especially hard to make it sound realistic.

It worked out all right. The check for the serial, plus 35¢ in cash, bought me that new car . . . and the book editions continue to sell and sell and sell, and have earned more than forty times as much as I was paid for the serial. So it was a financial success . . . but I do not consider it to be an artistic success.

While I was back east I told Campbell of my plans to quit writing later that year. He was not pleased as I was then his largest supplier of copy. I finally said, "John, I am not going to write any more stories against deadlines. But I do have a few more stories on tap that I could write. I'll send you a story from time to time . . . until the day

comes when you bounce one. At that point we're through. Now that I know you personally, having a story rejected by you would be too traumatic."

So I went back to California and sold him CROOKED HOUSE and LOGIC OF EMPIRE and UNIVERSE and SOLUTION UNSATISFACTORY and METHUSELAH'S CHILDREN and BY HIS BOOTSTRAPS and COMMON SENSE and GOLDFISH BOWL and BEYOND THIS HORIZON and WALDO and THE UNPLEASANT PROFESSION OF JONATHAN HOAG—which brings us smack up against World War II.

Campbell did bounce one of the above (and I shan't say which one) and I promptly retired—put in a new irrigation system—built a garden terrace—resumed serious photography, etc. This went on for about a month when I found that I was beginning to be vaguely ill: poor appetite, loss of weight, insomnia, jittery, absent-minded—much like the early symptoms of pulmonary tuberculosis, and I thought, "Damn it, am I going to have still a third attack?"

Campbell dropped me a note and asked why he hadn't heard from me?—I reminded him of our conversation months past: He had rejected one of my stories and that marked my retirement from an occupation that I had never planned to pursue permanently.

He wrote back and asked for another look at the story he had bounced. I sent it to him, he returned it promptly with the recommendation that I take out this comma, speed up the 1st half of page umpteen, delete that adjective—fiddle changes that Katie Tarrant would have done if told to.

I sat down at my typewriter to make the suggested changes . . . and suddenly realized that I felt good for the first time in weeks.

Bill "Tony Boucher" White had been dead right. Once you get the monkey on your back there is no cure short of the grave. I can leave the typewriter alone for weeks, even months, by going to sea. I can hold off for any necessary time if I am strenuously engaged in some other full-time,

worthwhile occupation such as a construction job, a political campaign, or (damn it!) recovering from illness.

But if I simply loaf for more than two or three days, that monkey starts niggling at me. Then nothing short of a few thousand words will soothe my nerves. And as I get older the attacks get worse; it is beginning to take 300,000 words and up to produce that feeling of warm satiation. At that I don't have it in its most virulent form; two of my colleagues are reliably reported not to have missed their daily fix in more than forty years.

The best that can be said for **SOLUTION UNSATISFACTORY** is that the solution is still unsatisfactory and the dangers are greater than ever. There is little satisfaction in having called the turn forty years ago; being a real-life Cassandra is not happy-making.



E.-T.'s of the Galaxy, Unite!
Help Stamp Out People!

FOREWORD

After World War II I resumed writing with two objectives: first, to explain the meaning of atomic weapons through popular articles; second, to break out from the limitations and low rates of pulp science-fiction magazines into anything and everything: slicks, books, motion pictures, general fiction, specialized fiction not intended for SF magazines, and nonfiction.

My second objective I achieved in every respect, but in my first and much more important objective I fell flat on my face.

Unless you were already adult in August 1945 it is almost impossible for me to convey emotionally to you how people felt about the A-bomb, how many different ways they felt about it, how nearly totally ignorant 99.9% of our citizens were on the subject, including almost all of our military leaders and governmental officials.

And including editors!

(The general public is just as dangerously ignorant as to the significance of nuclear weapons today, 1979, as in 1945—but in different ways. In 1945 we were smugly ignorant; in 1979 we have the Pollyannas, and the Ostriches, and the Jingoists who think we can “win” a nuclear war, and the group—a majority?—who regard World War III as of no importance compared with inflation, gasoline rationing, forced school-busing, or you name it. There is much excuse for the ignorance of 1945; the citizenry had been hit by ideas utterly new and strange. But there is no excuse for the ignorance of 1979. Ignorance today can be charged only to stupidity and laziness—both capital offences.)

I wrote nine articles intended to shed light on the post-Hiroshima age, and I have never worked harder on any writing, researched the background more thoroughly, tried harder to make the (grim and horrid) message entertaining and readable. I offered them to commercial markets, not to make money, but because the only propaganda

that stands any chance of influencing people is packaged so attractively that editors will buy it in the belief that the cash customers will be entertained by it.

Mine was not packaged that attractively.

I was up against some heavy tonnage:

General Groves, in charge of the Manhattan District (code name for A-bomb R&D), testified that it would take from twenty years to forever for another country to build an A-bomb. (USSR did it in 4 years.)

The Chief of Naval Operations testified that the "only" way to deliver the bomb to a target across an ocean was by ship.

A very senior Army Air Force general testified that "blockbuster" bombs were just as effective and cheaper.

The chairman of NACA (shortly to become NASA) testified (Science News Letter 25 May 1946) that intercontinental rockets were impossible.

Ad nauseum—the old sailors want wooden ships, the old soldiers want horse cavalry.

But I continued to write these articles until the U.S.S.R. rejected the United States' proposals for controlling and outlawing atomic weapons through open skies and mutual on-the-ground inspection, i.e., every country in the world to surrender enough of its sovereignty to the United Nations that mass-weapons war would become impossible (and lesser war unnecessary).

The U.S.S.R. rejected inspection—and I stopped trying to peddle articles based on tying the Bomb down through international policing.

I wish that I could say that thirty-three years of "peace" (i.e., no A- or H- or C- or N- or X- bombs dropped) indicates that we really have nothing to fear from such weapons, because the human race has sense enough not to commit suicide. But I am sorry to say that the situation is even more dangerous, even less stable, than it was in 1946.

Here are three short articles, each from a different ap-

proach, with which I tried (and failed) to beat the drum for world peace.

Was I really so naif that I thought that I could change the course of history this way? No, not really. But, damn it, I had to try!

Editor's note: Although it is our general policy to publish strictly new material, the second of the three articles mentioned above is timeless—and never more urgent than in this age of "essential strategic equivalence." It was "How to be a Survivor," by the way, that impelled me to commission the nuclear survival series that begins in this issue with "Gimme Shelter!"

"If you pray hard enough,
water will run uphill. How hard?
Why, hard enough to make water
run uphill, of course!"

—L. Long

HOW TO BE A SURVIVOR

The Art of Staying Alive in the Atomic Age

Thought about your life insurance lately?
Wait a minute—sit back down! We don't want to sell
you any insurance.

Let's put it another way: How's your pioneer blood
these days? Reflexes in fine shape? Muscle tone good?
Or do you take a taxi to go six blocks?

How are you at catching rabbits? The old recipe
goes, "First, catch the rabbit—" Suppose your supper
depended on catching a rabbit? Then on building a fire
without matches? Then on cooking it? What kind of
shape will you be in after the corner delicatessen is
atomized?

When a committee of Senators asked Dr. J. Robert
Oppenheimer whether or not a single attack on the
United States could kill forty million people, he testi-
fied, "I am afraid it is true."

This is not an article about making the atom bomb
safe for democracy. This is an article about *you*—and
how you can avoid being one of the forty million
knocked off in the first attack in World War III. How,
if worst comes to worst, you can live through the next
war, survive the aftermath, and build a new life.

If you have been reading the newspapers you are
aware that World War III, if it ever comes, is expected
to start with an all-out surprise attack by long-dis-

tance atomic bombing on the cities of America. General Marshall's final report included this assumption, General Arnold has warned us against such an attack, General Spaatz has described it and told us that it is almost impossible to ward it off if it ever comes. Innumerable scientists, especially the boys who built the A-bomb, have warned us of it.

From the newspapers you may also have gathered that world affairs are not in the best of shape—the Balkans, India, Palestine, Iran, Argentina, Spain, China, The East Indies, etc., etc.—and the UNO does not seem as yet to have a stranglehold on all of the problems that could lead to another conflict.

Maybe so, maybe not—time will tell. Maybe we will form a real World State strong enough to control the atom bomb. If you are sure there will never be war again, don't let me waste your time. But if you think it possible that another Hitler or Tojo might get hold of the atomic bomb and want to try his luck, then bend an ear and we'll talk about how you and your kids can live through it. We'll start with the grisly assumption that the war will come fast and hard, when it comes, killing forty million or so at once, destroying the major cities, wrecking most of our industry and utterly disorganizing the rest. We will assume a complete breakdown of government and communication which will throw the survivors—that's you, chum!—on their own as completely as ever was Dan'l Boone.

No government—remember that. The United States will cease to be a fact except in the historical sense. You will be on your own, with no one to tell you what to do and no policeman on the corner to turn to for protection. And you will be surrounded with dangerous carnivores, worse than the grizzlies Daniel Boone tackled—the two-legged kind.

Perhaps we had better justify the assumption of complete breakdown in government. It might not happen, but, if the new Hitler has sense enough to write

Mein Kampf, or even to read it as a textbook, he will do his very best to destroy and demoralize us by destroying our government—and his best could be quite efficient. If he wants to achieve political breakdown in his victim, Washington, D.C., will be his prime target, the forty-eight state capitals his secondary targets, and communication centers such as Kansas City his tertiary targets. The results should be roughly comparable to the effect on a man's organization when his head is chopped off.

Therefore, in this bad dream we are having, let us assume no government, no orders from Washington, no fireside chats, no reassurances. You won't be able to write to your congressman, because he, poor devil!, is marked for the kill. You can live through it, he can't. He will be radioactive dust. His profession is so hazardous that there is no need for him to study up on how to snare rabbits.

But you should—if you are smart, you can live through it.

Now as to methods—there is just one known way to avoid being killed by an atomic bomb. The formula is very simple:

Don't be there when it goes off!

Survival methods in the atomic age can be divided into two headings, strategical and tactical. The first or strategical aspect is entirely concerned with how not to be where the bomb is; the second, tactical part has to do with how to keep yourself and your family alive if you live through the destruction of the cities and the government.

Strategy first—the simplest way to insure long life for yourself and family is to move to Honduras or some other small and nonindustrialized country, establish yourself there, and quit worrying. It is most unlikely that such places will be subjected to atomic bombardment; if war comes, they will move into the economic

and political sphere of the winner, to be sure, but probably without bloodshed, since resistance would be so obviously futile.

However, you probably cannot afford, or feel that you can't afford, any move as drastic as that. (Whether or not you can in truth afford it is a moot point, to be settled by your own notion of the degree of danger. The pre-War refugees from Nazi Germany could not "afford" to flee, either, but events proved the wisdom of doing so. There is an old Chinese adage, "In the course of a long life a wise man will be prepared to abandon his baggage several times." It has never been more true than it is today.)

There are several moves open to you which are less drastic. If you live on a farm or in a small village, several miles—fifty is a good figure—from the nearest large city, rail junction, power dam, auto factory, or other likely military target, strategy largely takes care of itself. If you are blasted, it will probably be an accident, a rocket gone wild, or something equally unforeseeable. If you are not in such a location, you had better make some plans.

Just a moment—a gentleman in the back row has a question. A little louder please. He asks, "Isn't it true that the government is planning to disperse the cities so we will be safe from atomic bombs?"

I don't know—is it? The only figure I have heard mentioned so far is \$250,000,000,000. Quite aside from the question of whether or not large scale dispersion can be made effective, there is still the question as to whether or not Congress would appropriate a quarter of a trillion dollars in peacetime for any purpose. That is a political question, beyond the scope of this discussion. We are concerned here with how you, unassisted, with your two hands, your brain, and your ability to plan ahead, can keep yourself alive during and after any possible Next War.

If you have to live in a large city or other target area, your strategical planning has to be a good bit more

detailed, alert, and shifty. You need an emergency home, perhaps an abandoned farm picked up cheaply or a cabin built on government land. What it is depends on the part of the country you live in and how much money you can put into it, but it should be chosen with view to the possibilities it offers of eating off the country—fish, game, garden plot—and it should be near enough for you to reach it on one tank of gasoline. If the tank in your car is too small, have a special one built, or keep enough cans of reserve permanently in the trunk of your car. Your car should also be equipped with a survival kit, but that comes under tactics.

Having selected and equipped your emergency base, you must then, if you are to live in a target area, keep your ear to the ground and your eyes open with respect to world affairs. *There will be no time to get out after rockets are launched.* You will have to outguess events. This is a tricky assignment at best and is the principal reason why it is much better to live in the country in the first place, but you stand a fair chance of accomplishing it if you do not insist on being blindly optimistic and can overcome a natural reluctance to make a clean break with your past—business, home, clubs, friends, church—when it becomes evident that the storm clouds are gathering. Despite the tragic debacle at Pearl Harbor, quite a number of people, laymen among them, knew that a war with Japan was coming. If you think you can learn to spot the signs of trouble long enough in advance to jump, you may get away with living on the spot with the X mark.

Let us suppose that you were quick-witted, far sighted, and fast on your feet; you brought yourself and your family safely through the bombing and have them somewhere out in the country, away from the radioactive areas that were targets a short time before. The countryside is swarming with survivors from the edges of the bombed areas, survivors who are hun-

gry, desperate, some of them armed, all of them free of the civilizing restrictions of organized living. Enemy troops, moving in to occupy, may already be present or may be dropping in from the skies any day.

How, on that day, will you feed and protect yourself and your family?

The tactical preparations for survival after the debacle fall mainly into three groups. First is the over-haul of your own bodily assets, which includes everything from joining the YMCA, to get rid of that paunch and increase your wind and endurance, to such things as getting typhoid and cholera shots, having that appendix out, and keeping your teeth in the best shape possible. If you wear glasses, you will need several pairs against the day when there will be no opticians in practice. Second is the acquisition of various materials and tools which you will be unable to make or grow in a sudden, synthetic stone age—items such as a pickax or a burning glass, for example, will be worth considerably more than two college degrees or a diamond bracelet. Third is training in various fundamental pioneer skills, not only how to snare and cook rabbits, but such things as where and when to plant potatoes, how to tell edible fungi from deadly toadstools without trying them on Junior, and how to walk silently.

All these things are necessary, but more important, much more important, is the acquiring of a survival point of view, the spiritual orientation which will enable you to face hardship, danger, cold, and hunger without losing your zest and courage and sense of humor. If you think it is going to be too hard to be worthwhile, if you can't face the prospect of coming back to the ruins of your cabin, burned down by drunken looters, other than with the quiet determination to build another, then don't bother to start. Move to a target area and wait for the end. It does not take any special courage or skill to accept the death that moves like

lightning. You won't even have the long walk the steers have to make to get from the stockyard pens to the slaughter-house.

But if your ancestors still move in your bones, you will know that it is worthwhile, just as they did. "The cowards never started and the weaklings died on the way." That was the spirit that crossed the plains, and such was the spirit of every emigrant who left Europe. There is good blood in your veins, *compadre!*

It is not possible to tell exactly what to do to prepare yourself best to survive, even if this were a book instead of a short article, for the details must depend on the nature of the countryside you must rely on, your opportunities for planning and preparing, the numbers, ages and sex of your dependents if any, your present skills, talents, and physical condition, and whether or not you are at present dispersed from target areas or must plan for such dispersal. But the principles under which you can make your plans and the easiest means by which to determine them can be indicated.

Start out by borrowing your son's copy of the *Boy Scout Manual*. It is a practical book of the sort of lore you will need. If you can't borrow it because he is not a member of the Scouts, send him down at once and make him join up. Then make him study. Get him busy on those merit badges—woodcraft, cooking, archery, carpentry. *Somebody* is going to have to make that fire without matches, if that rabbit is ever to be cooked and eaten. See to it that he learns how, from experts. Then make him teach you.

Can you fell a tree? Can you trim a stone? Do you know where to dig a cesspool? Where and how to dig a well? Can you pull a tooth? Can you shoot a rifle accurately and economically? Can you spot tularemia (we are back to that ubiquitous rabbit again!) in cleaning a rabbit? Do you know the rudiments of farming? Given simple tools, could you build a log, or adobe, or

rammed-earth, or native-stone cabin from materials at hand and have it be weather-tight, varmint-proof, and reasonably comfortable?

You can't learn all the basic manual trades in your spare time in a limited number of years but you can acquire a jackleg but adequate knowledge of the more important ones, in the time we have left.

But how much time have we?

All we can do is estimate. How long will it be before other nations have the atomic bomb? Nobody knows—one estimate from the men who made it was "two to five years." Dr. Vannevar Bush spoke of "five to fifteen years" while another expert, equally distinguished, mentioned "five or ten years." Major General Leslie Groves, the atom general, thinks it will be a long time.

Let us settle on five years as a reasonable minimum working time. Of course, even if another nation, unfriendly to us, solved the production problems of atomic weapons in that length of time, there still might not be a war for a number of years, nor would there necessarily ever be one. However, since we don't know what world conditions will be like in five years, let's play it safe; let's try to be ready for it by 1950.

Four or five years is none too long to turn a specialized, soft, city dweller into a generalized, hardened pioneer. However, it is likely that you will find that you are enjoying it. It will be an interesting business and there is a deep satisfaction in learning how to do things with your own hands.

First get that *Scout Manual*. Look over that list of merit badges. Try to figure out what skills you are likely to need, what ones you now have, and what ones you need to study up on. The Manual will lead you in time to other books. Ernest Thompson Seton's *Two Little Savages* is full of ideas and suggestions.

Presently you will find that there are handbooks of various trades you have not time to master; books which contain information you could look up in an emergency if you have had the forethought to buy the

book and hide it away in your out-of-town base. There are books which show how to build fireplaces, giving the exact dimensions of reflector, throat, ledge, and flue. You may not remember such details; being able to look them up may save you from a winter in a smoke-filled cabin. If there is any greater domestic curse than a smoking fireplace, I can't recall it, unless it be the common cold.

There are little handbooks which show, in colored pictures, the edible mushrooms and their inedible cousins. It is possible to live quite well on practically nothing but fungi, with comparatively little work; they exist in such abundance and variety.

You will need a medical reference book, selected with the advice of a wise and imaginative medical man. Tell him why you want it. Besides that, the best first-aid and nursing instruction you can get will not be too much. Before you are through with this subject you will find yourself selecting drugs, equipment, and supplies to be stored against the darkness, in your base as well as a lesser supply to go into the survival kit you keep in your automobile.

What goes into that survival kit, anyhow? You will have to decide; you won't take any present advice in any case. By the time you get to it you will think, quite correctly, that you are the best judge. But the contents of the survival kits supplied our aviators in this latest war will be very illuminating. The contents varied greatly, depending on climate and nature of mission—from pemmican to quinine, fish hooks to maps.

What to put in your cabin is still more difficult to state definitely. To start with, you might obtain a Sears-Roebuck or Montgomery-Ward catalog and go through it, item by item. Ask yourself "Do I have to have this?", then from the list that produces ask yourself "Could I make this item, or a substitute, in a pinch?"

If shoes wear out, it is possible to make moccasins—although shoes should be hoarded in preference to any

other item of clothing. But you can't—unless you are Superman—make an ax. You will need an ax.

You will need certain drugs. Better be liberal here.

Salt is difficult to obtain, inland.

It is difficult to reject the idea of hoarding canned goods. A few hundred dollars worth, carefully selected, could supplement the diet of your family to the point of luxury for several years. It might save you from starvation, or the cannibalism that shamed the Donner Party, during your first winter of the Dark Ages, and it could certainly alleviate some of the sugar hunger you are sure to feel under most primitive conditions. But it is a very great risk to have canned goods. If you have them, you will be one of the hated rich if anybody finds out about them. We are assuming that there will be no government to protect you. To have canned goods—and have it known by anyone outside your own household—is to invite assassination. If you do not believe that a man will commit murder for one can of tomatoes, then you have never been hungry.

If you have canned goods, open them when the windows are shuttered and bury the cans. Resist the temptation to advertise your wealth by using the empty tins as receptacles.

Don't forget a can opener—two can openers.

You will have a rifle, high-powered and with telescopic sights, but you won't use it much. Cartridges are nearly irreplaceable. A deer or a man should be about the limit of the list of your targets . . . a deer when you need meat; a man when hiding or running is not enough.

That brings us to another subject and the most interesting of all. We have not talked much about the enemy, have we? And yet he was there, from the start. It was his atom bombs which reduced you to living off the country and performing your own amputations and accouchements. If you have laid your plans carefully, you won't see much of him for quite a while; this is a very, very big country. Where you are hidden out

there never were very many people at any time; the chances of occupation forces combing all of the valleys, canyons, and hills of our back country in less than several years is negligible. It is entirely conceivable that an enemy could conquer or destroy our country, as a state, in twenty minutes, with atom bomb and rocket. Yet, when his occupation forces move in, they will be almost lost in this great continent. He may not find you for years.

There is your chance. It has been proved time and again, by the Fighting French, the recalcitrant Irish, the deathless Poles, yes and by our own Apache and Yaqui Indians, that you cannot conquer a free man; you can only kill him.

After the immediate problems of the belly, comes the Underground!

You'll need your rifle. You will need knives. You will need dynamite and fuses. You will need to know how to turn them into grenades. You must learn how to harry the enemy in the dark, how to turn his conquest into a mockery, too expensive to exploit. Oh, it can be done, it can be done! Once he *occupies*, his temporary advantage of the surprise attack with the atom bomb is over, for once his troops are scattered among you, *he cannot use the atom bomb*.

Then is your day. Then is the time for the neighborhood cell, the mountain hideout, the blow in the night. Yes, and then is the time for the martyr to freedom, the men and women who die painfully, with sealed lips.

Can we then win our freedom back? There is no way of telling. History has some strange quirks. It was a conflict between England and France that gave us our freedom in the first place. A quarrel in enemy high places, a young hopeful feeling his oats and anxious to displace the original dictator, might give us unexpected opportunity, opportunity we could exploit if we were ready.

There are ways to study for that day, too. There are

books, many of them, which you may read to learn how other people have done it. One such book is Tom Wintringham's *New Ways of War*. It is almost a blueprint of what to do to make an invader wish he had stayed at home. It is available in a 25 cent Penguin-Infantry Journal edition. You can study up and become quite deadly, even though 4-F, or fifty.

If you plan for it, you can survive. If you study and plan and are ready to organize when the time comes, you can hope not only to survive but to play a part in winning back lost freedoms. General George Washington once quoted Scripture to describe what we were fighting for then—a time when "everyone shall sit in safety under his own vine and figtree, and none shall make him afraid!"

It is worth planning for.

"A person who won't be blackmailed,
can't be blackmailed."

—L. Long

PANDORA'S BOX

Once opened, the box could never be closed. But after the myriad swarming Troubles came Hope.

Science fiction is not prophecy. It often reads as if it were prophecy; indeed the practitioners of this odd genre (pun intentional—I won't do it again) of fiction usually strive hard to make their stories sound as if they were true pictures of the future. Prophecies.

Prophesying is what the weatherman does, the race track tipster, the stock market adviser, the fortuneteller who reads palms or gazes into a crystal. Each one is predicting the future—sometimes exactly, sometimes in vague, veiled, or ambiguous language, sometimes simply with a claim of statistical probability, but always with a claim seriously made of disclosing some piece of the future.

This is not at all what a science fiction author does. Science fiction is almost always laid in the future—or at least in a fictional possible-future—and is almost invariably deeply concerned with the shape of that future. But the method is not prediction; it is usually extrapolation and/or speculation. Indeed the author is not required to (and usually does not) regard the fictional "future" he has chosen to write about as being the events most likely to come to pass; his purpose may have nothing to do with the *probability* that these storied events may happen.

"Extrapolation" means much the same in fiction

writing as it does in mathematics: exploring a trend. It means continuing a curve, a path, a trend into the future, by extending its present direction and continuing the *shape* it has displayed in its past performance—i.e., if it is a sine curve in the past, you extrapolate it as a sine curve in the future, not as an hyperbola, nor a Witch of Agnesi, and *most certainly not* as a tangent straight line.

"Speculation" has far more elbowroom than extrapolation; it starts with a "What if?"—and the new factor thrown in by the what-if may be both wildly improbable and so revolutionary in effect as to throw a sine-curve trend (or a yeast-growth trend, or any trend) into something unrecognizably different. What if little green men land on the White House lawn and invite us to join a Galactic union?—or big green men land and enslave us and eat us? What if we solve the problem of immortality? What if New York City really does go dry? And not just the present fiddlin' shortage tackled by fiddlin' quarter-measures—can you imagine a man being lynched for wasting an ice cube? Living, as I do, in a state (Colorado—1965) which has just two sorts of water, too little and too much—we just finished seven years of drought with seven inches of rain in two hours, and one was about as disastrous as the other—I find a horrid fascination in Frank Herbert's *Dune World*, in Charles Einstein's *The Day New York Went Dry*, and in stories about Bible-type floods such as S. Fowler Wright's *Deluge*.

Most science fiction stories use both extrapolation and speculation. Consider "Blowups Happen," elsewhere in this volume. It was written in 1939, updated very slightly for book publication just after World War II by inserting some words such as "Manhattan Project" and "Hiroshima," but not rewritten, and is one of a group of stories published under the pretentious collective title of *The History of the Future* (!) (an editor's title, *not mine!*)—which certainly sounds like prophecy.

I disclaim any intention of prophesying; I wrote that story for the sole purpose of making money to pay off a mortgage and with the single intention of entertaining the reader. As prophecy the story falls flat on its silly face—any tenderfoot Scout can pick it to pieces—but I think it is still entertaining as a *story*, else it would not be here; I have a business reputation to protect and wish to continue making money. Nor am I ashamed of this motivation. Very little of the great literature of our heritage arose solely from a wish to "create art"; most writing, both great and not-so-great, has as its proximate cause a need for money combined with an aversion to, or an inability to perform, hard "honest labor." Fiction writing offers a legal and reasonably honest way out of this dilemma.

A science fiction author may have, and often does have, other motivations *in addition to* pursuit of profit. He may wish to create "art for art's sake," he may want to warn the world against a course he feels to be disastrous (Orwell's *1984*, Huxley's *Brave New World*—but please note that each is intensely entertaining, and that each made stacks of money), he may wish to urge the human race toward a course which he considers desirable (Bellamy's *Looking Backwards*, Wells' *Men Like Gods*), he may wish to instruct, or uplift, or even to dazzle. But the science fiction writer—*any* fiction writer—must keep entertainment consciously in mind as his prime purpose . . . or he may find himself back dragging that old cotton sack.

If he succeeds in this purpose, his story is likely to remain gripping entertainment long years after it has turned out to be false "prophecy." H. G. Wells is perhaps the greatest science fiction author of all time—and his greatest science fiction stories were written around sixty years ago (i.e., about 1895) . . . under the whip. Bedfast with consumption, unable to hold a job, flat broke, paying alimony—he *had* to make money somehow, and writing was the heaviest work he could manage. He was clearly aware (see his autobiography)

that to stay alive he must be entertaining. The result was a flood of some of the most brilliant speculative stories about the future ever written. As prophecy they are all hopelessly dated . . . which matters not at all; they are as spellbinding now as they were in the Gay 'Nineties and the Mauve Decade.

Try to lay hands on his *The Sleeper Awakes*. The gadgetry in it is ingenious—and all wrong. The projected future in it is brilliant—and did not happen. All of which does not sully the story; it is a great story of love and sacrifice and blood-chilling adventure set in a matrix of mind-stretching speculation about the nature of Man and his Destiny. I read it first in 1923, and at least a dozen times since . . . and still reread it whenever I get to feeling uncertain about just how one does go about the unlikely process of writing fiction for entertainment of strangers—and again finding myself caught up in the sheer excitement of Wells' story.

"Solution Unsatisfactory" herein is a consciously Wellsian story. No, no, I'm not claiming that it is of H. G. Wells' quality—its quality is for you to judge, not me. But it was written by the method which Wells spelled out for the speculative story: Take one, just one, basic new assumption, then examine all its consequences—but express those consequences in terms of human beings. The assumption I chose was the "Absolute Weapon"; the speculation concerns what changes this forces on mankind. But the "history" the story describes simply did not happen.

However the problems discussed in this story are as fresh today, the issues just as poignant, for the grim reason that we have not reached even an "unsatisfactory" solution to the problem of the Absolute Weapon; we have reached *no* solution.

In the years that have passed since I wrote that story (in 1940) the world situation has grown much worse. Instead of one Absolute Weapon there are now at least five distinct types—an "Absolute Weapon" being de-

fined as one against which there is no effective defense and which kills indiscriminately over a very wide area. The earliest of the five types, the A-bomb, is now known to be possessed by at least five nations; at least twenty-five other nations have the potential to build them in the next few years.

But there is a possible sixth type. Earlier this year (1965-R.A.H.) I attended a seminar at one of the nation's new think-factories. One of the questions discussed was whether or not a "Doomsday Bomb" could be built—a single weapon which would destroy all life of all sorts on this planet; *one* weapon, not an all-out nuclear holocaust involving hundreds of thousands of ICBMs. No, this was to be a world-wrecker of the sort Dr. E. E. Smith used to use in his interstellar sagas back in the days when SF magazines had bug-eyed monsters on the cover and were considered lowbrow, childish, fantastic.

The conclusions reached were: Could the Doomsday Machine be built?—yes, no question about it. What would it cost?—quite cheap.

A seventh type hardly seems necessary.

And that makes the grimness of "Solution Unsatisfactory" seem more like an Oz book in which the most harrowing adventures always turn out happily.

"Searchlight" is almost pure extrapolation, almost no speculation. The gadgets in it are either hardware on the shelf, or hardware which will soon be on the shelf because nothing is involved but straightforward engineering development. "Life-Line" (my first story) is its opposite, a story which is sheer speculation and either impossible or very highly improbable, as the What-If postulate will never be solved—I think. I hope. But the two stories are much alike in that neither depends on when it was written nor when it is read. Both are independent of any particular shape to history; they are timeless.

"Free Men" is another timeless story. As told, it

looks like another "after the blowup" story—but it is not. Although the place is nominally the United States and the time (as shown by the gadgetry) is set in the not-distant future, simply by changing names of persons and places and by inserting other weapons and other gadgets this story could be any country and any time in the past or future—or could even be on another planet and concern a non-human race. But the story does also apply here-and-now, so I told it that way.

"Pandora's Box" was the original title of an article researched and written in 1949 for publication in 1950, the end of the half-century. Inscrutable are the ways of editors: it appeared with the title "Where To?" and purported to be a nonfiction prophecy concerning the year 2000 A.D. as seen from 1950. (I agree that a science fiction writer should avoid marijuana, prophecy, and time payments—but I was tempted by a soft rustle.)

Our present editor (1965) decided to use this article, but suggested that it should be updated. Authors who wish to stay in the business listen most carefully to editors' suggestions, even when they think an editor has been out in the sun without a hat; I agreed.

And reread "Where To?" and discovered that our editor was undeniably correct; it needed updating. At least.

But at last I decided not to try to conceal my bloopers. Below is reproduced, unchanged, my predictions of fifteen years back. But here and there through the article I have inserted signs for footnotes—like this: (z)—and these will be found at the end of the 1950 article . . . calling attention to bloopers and then forthrightly excusing myself by rationalizing how anyone, even Nostradamus, would have made the same mistake . . . hedging my bets in other cases, or chucking in brand-new predictions and carefully laying them farther in the future than I am likely to live . . . and, in some cases, crowing loudly about successful

predictions. (Addendum 1979: I have interpolated the later comments, and marked each item 1950, or 1965, or 1980.)

So—

WHERE TO?

*A bloomin', foolish sparrow
Built his nest in a spout,
And along—*

—came a building inspector, looked over the site, and the plans, and okayed them, after requiring the sparrow to buy eleven different licenses totalling 18% of the sparrow's building budget, plus something called special service, and along—

*—the bleedin' rains came,
And washed the sparrow out.*

*Again the foolish sparrow,
Built his nest in the spout,
And again—*

—came that building inspector, bawled out the sparrow for failing to get special licenses and permits covering typhoons, sun spots, and ice ages, required him to buy seventeen permits and/or licenses and appear before boards controlling zoning, economic impact, ecological protection, energy conservation, and community esthetics, plus something called "very special service"—and a second mortgage, and along—

*—the bleedin' rains came,
And washed the sparrow out. (Around again...and again...and—)*

1950 Where To?

Most science fiction consists of big-muscled stories about adventures in space, atomic wars, invasions by extra-terrestrials, and such. All very well—but now we will take time out for a look at ordinary home life half a century hence.

Except for tea leaves and other magical means, the only way to guess at the *future* is by examining the *present* in the light of the *past*. Let's go back half a century and visit your grandmother before we attempt to visit your grandchildren.

1900: Mr. McKinley is President and the airplane has not yet been invented. Let's knock on the door of that house with the gingerbread, the stained glass, and the cupola.

The lady of the house answers. You recognize her—your own grandmother, Mrs. Middleclass. She is almost as plump as you remember her, for she "put on some good, healthy flesh" after she married.

She welcomes you and offers coffee cake, fresh from her modern kitchen (running water from a hand pump; the best coal range Pittsburgh ever produced). Everything about her house is modern—hand-painted china, souvenirs from the Columbian Exposition, beaded portières, shining baseburner stoves, gas lights, a telephone on the wall.

There is no bathroom, but she and Mr. Middleclass

are thinking of putting one in. Mr. Middleclass's mother calls this nonsense, but your grandmother keeps up with the times. She is an advocate of clothing reform, wears only one petticoat, bathes twice a week, and her corsets are guaranteed rust proof. She has been known to defend female suffrage—but not in the presence of Mr. Middleclass.

Nevertheless, you find difficulty in talking with her. Let's jump back to the present and try again.

The automatic elevator takes us to the ninth floor, and we pick out a door by its number, that being the only way to distinguish it.

"Don't bother to ring," you say? What? It's *your* door and you know exactly what lies beyond it—

Very well, let's move a half century into the future and try another middle class home.

It's a suburban home not two hundred miles from the city. You pick out your destination from the air while the cab is landing you—a cluster of hemispheres that makes you think of the houses Dorothy found in Oz.

You set the cab to return to its hangar and go into the entrance hall. You neither knock nor ring. The screen has warned them before you touched down on the landing flat and the autobutler's transparency is shining with: PLEASE RECORD A MESSAGE.

Before you can address the microphone a voice calls out, "Oh, it's you! Come in, come in." There is a short wait, as your hostess is not at the door. The autobutler flashed your face to the patio—where she was reading and sunning herself—and has relayed her voice back to you.

She pauses at the door, looks at you through one-way glass, and frowns slightly; she knows your old-fashioned disapproval of casual nakedness. Her kindness causes her to disobey the family psychiatrist; she grabs a robe and covers herself before signaling the door to open.

The psychiatrist was right; you have thus been

classed with strangers, tradespeople, and others who are not family intimates. But you must swallow your annoyance; you cannot object to her wearing clothes when you have sniffed at her for not doing so.

There is no reason why she should wear clothes at home. The house is clean—not somewhat clean, but *clean*—and comfortable. The floor is warm to bare feet; there are no unpleasant drafts, no cold walls. All dust is precipitated from the air entering this house. All textures, of floor, of couch, of chair, are comfortable to bare skin. Sterilizing ultra-violet light floods each room whenever it is unoccupied, and, several times a day, a "whirlwind" blows house-created dust from all surfaces and whisks it out. These auto services are unobtrusive because automatic cut-off switches prevent them from occurring whenever a mass in a room is radiating at blood temperature.

Such a house can become untidy, but not dirty. Five minutes of straightening, a few swipes at children's fingermarks, and her day's housekeeping is done. Often more than sheets were changed in Mr. McKinley's day, this housewife rolls out a fresh layer of sheeting on each sitting surface and stuffs the discard down the oubliette. This is easy; there is a year's supply on a roll concealed in each chair or couch. The tissue sticks by pressure until pulled loose and does not obscure the pattern and color.

You go into the family room, sit down, and remark on the lovely day. "Isn't it?" she answers. "Come sunbathe with me."

The sunny patio gives excuse for bare skin by anyone's standards; thankfully she throws off the robe and stretches out on a couch. You hesitate a moment. After all, she is your own grandchild, so why not? You undress quickly, since you left your outer wrap and shoes at the door (only barbarians wear street shoes in a house) and what remains is easily discarded. Your grandparents had to get used to a mid-century beach. It was no easier for them.

On the other hand, their bodies were wrinkled and old, whereas yours is not. The triumphs of endocrinology, of cosmetics, of plastic surgery, of figure control in every way are such that a woman need not change markedly from maturity until old age. A woman can keep her body as firm and slender as she wishes—and most of them so wish. This has produced a paradox: the United States has the highest percentage of old people in all its two and a quarter centuries, yet it seems to have a larger proportion of handsome young women than ever before.

(Don't whistle, son! That's your grandmother—)

This garden is half sunbathing patio, complete with shrubs and flowers, lawn and couches, and half swimming pool. The day, though sunny, is quite cold—but not in the garden, and the pool is not chilly. The garden appears to be outdoors, but is not; it is covered by a bubble of transparent plastic, blown and cured on the spot. You are inside the bubble; the sun is outside; you cannot see the plastic.

She invites you to lunch; you protest. "Nonsense!" she answers, "I like to cook." Into the house she goes. You think of following, but it is deliciously warm in the March sunshine and you are feeling relaxed to be away from the city. You locate a switch on the side of the couch, set it for gentle massage, and let the couch knead your troubles away. The couch notes your heart rate and breathing; as they slow, so does it. As you fall asleep it stops.

Meanwhile your hostess has been "slaving away over a hot stove." To be precise, she has allowed a menu selector to pick out an 800-calory, 4-ration-point luncheon. It is a random-choice gadget, somewhat like a slot machine, which has in it the running inventory of her larder and which will keep hunting until it turns up a balanced meal. Some housewives claim that it takes the art out of cookery, but our hostess is one of many who have accepted it thankfully as an endless source of new menus. Its choice is limited today as it

has been three months since she has done grocery shopping. She rejects several menus; the selector continues patiently to turn up combinations until she finally accepts one based around fish disguised as lamb chops.

Your hostess takes the selected items from shelves or the freezer. All are prepared; some are pre-cooked. Those still to be cooked she puts into her—well, her "processing equipment," though she calls it a "stove." Part of it traces its ancestry to diathermy equipment; another feature is derived from metal enameling processes. She sets up cycles, punches buttons, and must wait two or three minutes for the meal to cook. She spends the time checking her ration accounts.

Despite her complicated kitchen, she doesn't eat as well as her great grandmother did—too many people and too few acres.

Never mind; the tray she carries out to the patio is well laden and beautiful. You are both willing to nap again when it is empty. You wake to find that she has burned the dishes and is recovering from her "exertion" in her refresher. Feeling hot and sweaty from your nap you decide to use it when she comes out. There is a wide choice offered by the 'fresher, but you limit yourself to a warm shower growing gradually cooler, followed by warm air drying, a short massage, spraying with scent, and dusting with powder. Such a simple routine is an insult to a talented machine.

Your host arrives home as you come out; he has taken a holiday from his engineering job and has had the two boys down at the beach. He kisses his wife, shouts, "Hi, Duchess!" at you, and turns to the video, setting it to hunt and sample the newscasts it has stored that day. His wife sends the boys in to 'fresh themselves then says, "Have a nice day, dear?"

He answers, "The traffic was terrible. Had to make the last hundred miles on automatic. Anything on the phone for me?"

"Weren't you on relay?"

"Didn't set it. Didn't want to be bothered." He steps to the house phone, plays back his calls, finds nothing he cares to bother with—but the machine goes ahead and prints one message; he pulls it out and tears it off.

"What is it?" his wife asks.

"Telestat from Luna City—from Aunt Jane."

"What does she say?"

"Nothing much. According to her, the Moon is a great place and she wants us to come visit her."

"Not likely!" his wife answers. "Imagine being shut up in an air-conditioned cave."

"When you are Aunt Jane's age, my honey lamb, and as frail as she is, with a bad heart thrown in, you'll go to the Moon and like it. Low gravity is not to be sneezed at—Auntie will probably live to be a hundred and twenty, heart trouble and all."

"Would *you* go to the Moon?" she asks.

"If I needed to and could afford it." He turns to you. "Right?"

You consider your answer. Life still looks good to you—and stairways are beginning to be difficult. Low gravity is attractive even though it means living out your days at the Geriatrics Foundation on the Moon. "It might be fun to visit," you answer. "One wouldn't have to stay."

Hospitals for old people on the Moon? Let's not be silly—

Or is it silly? Might it not be a logical and necessary outcome of our world today?

Space travel we will have, not fifty years from now, but much sooner. It's breathing down our necks. As for geriatrics on the Moon, for most of us no price is too high and no amount of trouble is too great to extend the years of our lives. It is possible that low gravity (one sixth, on the Moon) may not lengthen lives; nevertheless it *may*—we don't know yet—and it will most certainly add greatly to comfort on reaching that inevitable age when the burden of dragging around

one's body is almost too much, or when we would otherwise resort to an oxygen tent to lessen the work of a worn-out heart.

By the rules of prophecy, such a prediction is *probable*, rather than impossible.

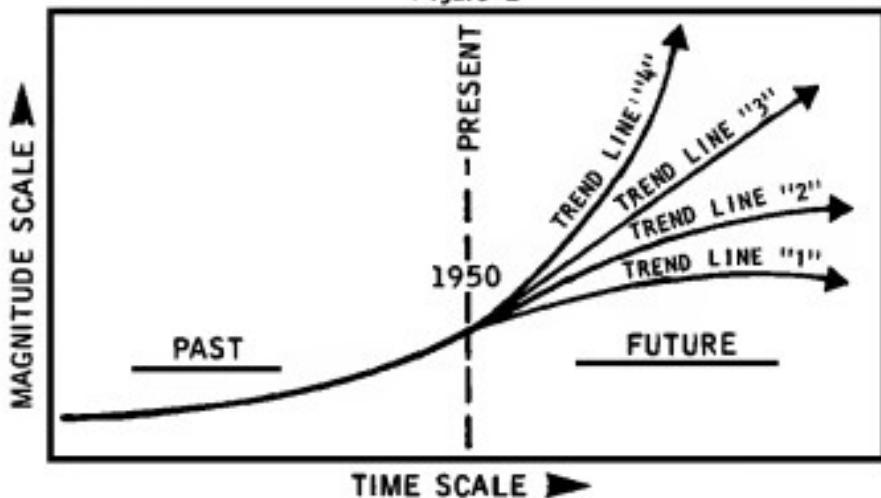
But the items and gadgets suggested above are examples of *timid* prophecy.

What are the rules of prophecy, if any?

Look at the graph shown here. The solid curve is what has been going on this past century. It represents many things—use of power, speed of transport, numbers of scientific and technical workers, advances in communication, average miles traveled per person per year, advances in mathematics, the rising curve of knowledge. Call it the curve of human achievement.

What is the correct way to project this curve into the future? Despite everything, there is a stubborn "common sense" tendency to project it along dotted line

Figure 1



number one—like the patent office official of a hundred years back who quit his job “because everything had already been invented.” Even those who don’t expect a slowing up at once tend to expect us to reach a point of diminishing returns (dotted line number two).

Very daring minds are willing to predict that we will continue our present rate of progress (dotted line number three—a tangent).

But the proper way to project the curve is dotted line number four—for there is no reason, mathematical, scientific, or historical, to expect that curve to flatten out, or to reach a point of diminishing returns, or simply to go on as a tangent. The correct projection, by all facts known today, is for the curve to go on up indefinitely with *increasing steepness*.

The timid little predictions earlier in this article actually belong to curve one, or, at most, to curve two. You can count on the changes in the next fifty years at least *eight times* as great as the changes of the past fifty years.

The Age of Science has not yet opened.

AXIOM: A “nine-days’ wonder” is taken as a matter of course on the tenth day.

AXIOM: A “common sense” prediction is sure to err on the side of timidity.

AXIOM: The more extravagant a prediction sounds the more likely it is to come true.

So let’s have a few free-swinging predictions about the future.

Some will be wrong—but cautious predictions are *sure* to be wrong.

1. 1950 Interplanetary travel is waiting at your front door—C.O.D. It’s yours when you pay for it.

1965 And now we are paying for it and the cost is high. But, for reasons understandable only to bureaucrats, we have almost halted development of a nu-

clear-powered spacecraft when success was in sight. Never mind; if we don't another country will. By the end of this century space travel will be cheap.

1980 And now the Apollo-Saturn Man-on-the-Moon program has come and gone, and all we have now in the U.S.A. as a new man-in-space program is the Space Shuttle—underfinanced and two years behind schedule. See my article SPINOFF on page 500 of this book, especially the last two pages.

Is space travel dead? *No, because the United States is not the only nation on this planet.* Today both Japan and Germany seem to be good bets—countries aware that endless wealth is out there for the taking. USSR seems to be concentrating on the military aspects rather than on space travel, and the People's Republic of China does not as yet appear to have the means to spare—but don't count out either nation; the potential is there, in both cases.

And don't count out the United States! Today most of our citizens regard the space program as a boondoggle (totally unaware that it is one of the very few Federal programs that paid for themselves, manyfold). But we are talking about twenty years from now, 2000 A.D. Let's see it in perspective. Exactly thirty years ago George Pal and Irving Pichel and I—and ca. 200 others—were making the motion picture DESTINATION MOON. I remember sharply that most of the people working on that film started out thinking that it was a silly fantasy, an impossibility. I had my nose rubbed in it again and again, especially if the speaker was unaware that I had written it. (Correction: written the first version of it. By the time it was filmed, even the banker's wife was writing dialog.)

As for the general public—A trip to the Moon? Nonsense!

That was thirty years ago, late 1949.

Nineteen years and ten months later Apollo 11 landed on the Moon.

Look again at the curves on page 322. With respect

to space travel (and industry, power, and colonization) we have dropped to that feeble curve #1—but we could shift back to curve #4 overnight if our President and/or Congress got it through their heads that not one but all of our crisis problems can be solved by exploiting space. Employment, inflation, pollution, population, energy, running out of nonrenewable resources—there is pie in the sky for the U.S.A. and for the entire planet including the impoverished "Third World."

I won't try to prove it here. See THE THIRD INDUSTRIAL REVOLUTION by G. Harry Stine, 1979, Ace Books, 360 Park Avenue South, New York, NY 10010, and see A STEP FARTHER OUT by Dr. Jerry Pournelle, also Ace Books 1979—and accept my assurance that I have known both authors well for twenty-odd years, know that each has years of experience in aerospace, and that each has both the formal education and the continuing study—and the horse sense!—to be true experts in this matter.

From almost total disbelief about space travel (99.9% +) to a landing on the Moon in twenty years . . . from President Kennedy's announcement of intention to that Lunar landing in only seven years . . . and still twenty years to go until the year 2000—we can still shift to curve #4 (and get rich) almost overnight. By 2000 A.D. we could have O'Neill colonies, self-supporting and exporting power to Earth, at both Lagrange-4 and Lagrange-5, transfer stations in orbit about Earth and around Luna, a permanent base on Luna equipped with an electric catapult—and a geriatrics retirement home.

However, I am not commissioned to predict what we could do but to predict (guess) what is most likely to happen by 2000 A.D.

Our national loss of nerve, our escalating anti-intellectualism, our almost total disinterest in anything that does not directly and immediately profit us, the shambles of public education throughout most of our nation (especially in New York and California) cause

me to predict that *our space program will continue to dwindle*. It would not surprise me (but would distress me mightily!) to see the Space Shuttle canceled.

In the meantime some other nation or group will start exploiting space—industry, power, perhaps Lagrange-point colonies—and suddenly we will wake up to the fact that we have been left at the post. That happened to us in '57; we came up from behind and passed the competition. Possibly we will do it again. Possibly—

But I am making no cash bets.

2. 1950 Contraception and control of disease is revising relations between the sexes to an extent that will change our entire social and economic structure.

1965 This trend is so much more evident now than it was fifteen years ago that I am tempted to call it a fulfilled prophecy. Vast changes in sex relations are evident all around us—with the oldsters calling it "moral decay" and the youngsters ignoring them and taking it for granted. Surface signs: books such as *Sex and the Single Girl* are smash hits; the formerly-taboo four-letter words are now seen both in novels and popular magazines; the neologism "swinger" has come into the language; courts are conceding that nudity and semi-nudity are now parts of the cultural *mores*. But the end is not yet; this revolution will go much farther and is now barely started.

The most difficult speculation for a science fiction writer to undertake is to imagine correctly the *secondary* implications of a new factor. Many people correctly anticipated the coming of the horseless carriage; some were bold enough to predict that everyone would use them and the horse would virtually disappear. But I know of no writer, fiction or nonfiction, who saw ahead of time the vast change in the courting and mating habits of Americans which would result primarily from the automobile—a change which the diaphragm and the oral contraceptive merely con-

firmed. So far as I know, no one even dreamed of the change in sex habits the automobile would set off.

There is some new gadget in existence today which will prove to be equally revolutionary in some other way equally unexpected. You and I both know of this gadget, by name and by function—but we don't know which one it is nor what its unexpected effect will be. This is why science fiction is *not* prophecy—and why fictional speculation can be so much fun both to read and to write.

1980 (No, I still don't know what that revolutionary gadget is—unless it is the computer chip.) The sexual revolution: it continues apace—FemLib, GayLib, single women with progeny and never a lifted eyebrow, staid old universities and colleges that permit unmarried couples to room together on campus, group marriages, "open" marriages, miles and miles of "liberated" beaches. Most of this can be covered by one sentence: What used to be concealed is now done openly. But sexual attitudes are in flux; the new ones not yet cultural *mores*.

But I think I see a trend, one that might jell by 2000 A.D. The racial biological function of "family" is the protection of children and pregnant women. To accomplish that, family organization must be rewarding to men as well . . . and I do *not* mean copulation. There is a cynical old adage covering that: "Why keep a cow when milk is so cheap?" A marriage must offer its members emotional, spiritual, and physical comforts superior to those to be found in living alone if that prime function is to be accomplished.

(Stipulated: there are individuals, both sexes, who prefer to live alone. This is racially self-correcting.)

The American core family (father, mother, two or three children) has ceased to be emotionally satisfying—if it ever was. It is a creation of our times: mobility, birth control, easy divorce. Early in this century the core family was mother, father, four to eight children . . . and was itself a unit in an extended family of

grandparents, aunts, uncles, and cousins living near enough (if not in the same house) to be mutually supportive. If a child was ill, Aunt Cora came over to help while Aunt Abby took the other kids into her home. See *Mauve Decade* fiction.

With increased mobility and fewer children this undefined extended-family pattern disappeared almost without its disappearance being noticed. To the extent to which it was noticed there was often glee at being free of the nuisance of in-laws and kinfolk. It took considerably longer to realize that the advantages had also disappeared.

We will not get a return of the extended family of the sort that characterized the 19th century and the early 20th . . . but the current flux of swingers' clubs, group marriages, spouse swapping, etc., is, in my opinion, fumbling and almost unconscious attempts to regain the pleasure, emotional comfort, and mutual security once found in the extended family of two or more generations back.

Prediction: by 2000 A.D. or soon thereafter extended families of several sorts will be more common than core families. The common characteristic of the various types will be increased security for children under legally enforceable contracts.

3. 1950 The most important military fact of this century is that there is no way to repel an attack from outer space.

1965 I flatly stand by this one. True, we are now working on Nike-Zeus and Nike-X and related systems and plan to spend billions on such systems—and we know that others are doing the same thing. True, it is possible to hit an object in orbit or trajectory. Nevertheless this prediction is as safe as predicting tomorrow's sunrise. Anti-aircraft fire never stopped air attacks; it simply made them expensive. The disadvantage in being at the bottom of a deep "gravity well" is very great; gravity gauge will be as crucial in the

coming years as wind gauge was in the days when sailing ships controlled empires. The nation that controls the Moon will control the Earth—but no one seems willing these days to speak that nasty fact out loud.

1980 I have just heard a convincing report that the USSR has developed lasers far better than ours that can blind our eyes-in-the-sky satellites and, presumably, destroy our ICBMs in flight. Stipulate that this rumor is true: It does not change my 1950 assertion one iota. Missiles tossed from the Moon to the Earth need not be H-bombs or any sort of bomb—or even missile-shaped. All they need be is massive... because they arrive at approximately *seven miles per second*. A laser capable of blinding a satellite and of disabling an ICBM to the point where it can't explode would need to be orders of magnitude more powerful in order to volatilize a house-size chunk of Luna. For further details see my THE MOON IS A HARSH MISTRESS.

4. 1950 It is utterly impossible that the United States will start a "preventive war." We will fight when attacked, either directly or in a territory we have guaranteed to defend.

1965 Since 1950 we have done so in several theaters and are doing so in Viet Nam as this is written. "Preventive" or "pre-emptive" war seems as unlikely as ever, no matter who is in the White House. Here is a new prediction: World War III (as a major, all-out war) will not take place at least until 1980 and could easily hold off until 2000. This is a very happy prediction compared with the situation in 1950, as those years of grace may turn up basic factors which (I hope!) may postpone disaster still longer. We were *much* closer to ultimate disaster around 1955 than we are today—much closer indeed than we were at the time of the Cuban Confrontation in 1962. But the public never knew it. All in all, things look pretty good for survival, for the time being—and that is as good a

break as our ancestors ever had. It was far more dangerous to live in London in 1664-5 than it is to live in a city threatened by H-bombs today.

1980 I am forced to revise the 1950 prediction to this extent: It is no longer certain that we will fight to repel attack on territory we have guaranteed to defend; our behavior both with respect to Viet Nam and to Taiwan is a clear warning to our NATO allies. The question is not whether we should ever have been in Viet Nam or whether we should ever have allied ourselves to the Nationalist Chinese. I do not know of *any* professional military man who favored ever getting into combat on the continent of Asia; such war for us is a logistic and strategic disaster.

But to break a commitment to an ally *once it has been made* is to destroy our credibility.

5. 1950 In fifteen years the housing shortage will be solved by a "breakthrough" into new technology which will make every house now standing as obsolete as privies.

1965 Here I fell flat on my face. There has been no breakthrough in housing, nor is any now in prospect—instead the ancient, wasteful methods of building are now being confirmed by public subsidies. The degree of our backwardness in the field is hard to grasp; we have never seen a modern house. Think what an automobile would be if each one were custom-built from materials fetched to your home—what would it look like, what would it do, and how much would it cost. But don't set the cost lower than \$100,000 or the speed higher than 10 m/h, if you want to be realistic about the centuries of difference between the housing industry and the automotive industry.

I underestimated (through wishful thinking) the power of human stupidity—a fault fatal to prophecy.

1980 I'm still flat on my face with my nose rubbed in the mud; the situation is worse than ever. See **A BATHROOM OF HER OWN** on page 244. And that figure of

\$100,000 just above was with gold at \$35 per troy ounce—so change it to one million dollars—or call it 2700 troy ounces of gold. Or forget it. The point is that it would be very nearly impossible to build even a clunker automobile at any price if we built them the way we build houses.

We have the technology to build cheap, beautiful, efficient, flexible (modular method) houses, extremely comfortable and with the durability of a Rolls Royce. But I cannot guess when (if ever) the powers that be (local bureaucrats, unions, building materials suppliers, county and state officials) will permit us poor serfs to have modern housing.

6. 1950 We'll all be getting a little hungry by and by.

1965 No new comment.

1980 Not necessarily. In 1950 I was too pessimistic concerning population. Now I suspect that the controlling parameter is oil. In modern agriculture oil is the prime factor—as power for farm machinery (obviously) but also for insecticides and for fertilizers. Since our oil policies in Washington are about as boneheaded—counterproductive—as they can be, I have no way to guess how much food we can raise in 2000 A.D. But no one in the United States should be hungry in 2000 A.D.—unless we are conquered and occupied.

7. 1950 The cult of the phony in art will disappear. So-called "modern art" will be discussed only by psychiatrists.

1965 No new comment.

1980 One may hope. But art reflects culture and the world is even nuttier now than it was in 1950; these are the Crazy Years. But, while "fine" art continues to look like the work of retarded monkeys, commercial art grows steadily better.

8. 1950 Freud will be classed as a pre-scientific, intuitive pioneer and psychoanalysis will be replaced by

a growing, changing "operational psychology" based on measurement and prediction.

1965 No new comment.

1980 This prediction is beginning to come true. Freud is no longer taken seriously by informed people. More and more professional psychologists are skilled in appropriate mathematics; most of the younger ones understand inductive methodology and the nature of scientific confirmation and are trying hard to put rigor into their extremely difficult, still inchoate subject. For some of the current progress see Dr. Pournelle's book, cited on page 325.

By 2000 A.D. we will know a great deal about how the brain functions . . . whereas in 1900 what little we knew was wrong.

I do *not* predict that the basic mystery of psychology—how mass arranged in certain complex patterns becomes aware of itself—will be solved by 2000 A.D. I hope so but do not expect it.

9. 1950 Cancer, the common cold, and tooth decay will all be conquered; the revolutionary new problem in medical research will be to accomplish "regeneration," i.e., to enable a man to grow a new leg, rather than fit him with an artificial limb.

1965 In the meantime spectacular progress has been made in organ transplants—and the problem of regeneration is related to this one. Biochemistry and genetics have made a spectacular breakthrough in "cracking the genetic code." It is a tiny crack, however, with a long way to go before we will have the human chromosomes charted and still longer before we will be able to "tailor" human beings by gene manipulation. The possibility is there—but not by year 2000. This is probably just as well. If we aren't bright enough to build decent houses, are we bright enough to play God with the architecture of human beings?

1980 I see no reason to change this prediction if you will let me elaborate (weasel) a little. "The common

"cold" is a portmanteau expression for upper respiratory infections which appear to be caused by a very large number of different viruses. Viruses are pesky things. It is possible to immunize against them, e.g., vaccination against smallpox, a virus disease. But there are almost no chemotherapies, medicines, against viruses. That is why "the common cold" is treated much the same way today as in 1900, i.e., support the patient with bed rest, liquids, aspirin to make him more comfortable, keep him warm. This was standard in 1900 and it is still standard in 1980.

It is probable that your body makes antibodies against the virus of any cold you catch. But this gives you no protection against that virus's hundreds of close relatives found in any airport, theater, supermarket, or gust of dust off the street. In the meantime, while his kinfolk take turns making you miserable, virus #1 has mutated and you have no antibodies against the mutation.

Good news: Oncology (cancer), immunology, hematology, and "the common cold" turn out to be strongly interrelated subjects; research in all these is moving fast—and a real breakthrough in any one might mean a breakthrough in all.

10. 1950 By the end of this century mankind will have explored this solar system, and the first ship intended to reach the nearest star will be a building.

1965 Our editor suggested that I had been too optimistic on this one—but I still stand by it. It is still thirty-five years to the end of the century. For perspective; look back thirty-five years to 1930—the American Rocket Society had not yet been founded. Another curve, similar to the one herewith in shape but derived entirely from speed of transportation, extrapolates to show faster-than-light travel by year 2000. I guess I'm chicken, for I am not predicting FTL ships by then, if ever. But the prediction still stands without hedging.

1980 My money is still on the table at twenty years

and counting. Senator Proxmire can't live forever. In the last 10½ years men have been to the Moon several times; much of the Solar system has been most thoroughly explored within the limits of "black box" technology and more will be visited before this year is out.

Ah, but not explored by *men*—and the distances are so great. Surely they are . . . by free-fall orbits, which is all that we have been using. But there are numerous proposals (and not all ours!) for constant-boost ships, proposals that require R&D on present art only—no breakthroughs.

Reach for your pocket calculator and figure how long it would take to make a trip to Mars and back if your ship could boost at one-tenth gee. We will omit some trivia by making it from parking orbit to parking orbit, use straight-line trajectories, and ignore the Sun's field—we'll be going uphill to Mars, downhill to Earth; what we lose on the roundabouts we win on the shys.

These casual assumptions would cause Dan Alderson, ballistician at Jet Propulsion Laboratory, to faint. But after he comes out of his faint he would agree that our answers would be of correct close order of magnitude—and all I'm trying to prove is that even a slight constant boost makes an enormous difference in touring the Solar System. (Late in the 21st century we'll offer the Economy Tour: Ten Planets in Ten Days.)

There are an unlimited number of distances between rather wide parameters for an Earth-Mars-Earth trip but we will select one that is nearly minimum (it's cheating to wait in orbit at Mars for about a year in order take the shortest trip each way . . . and unthinkable to wait years for the closest approach). We'll do this Space Patrol style: There's Mars, here we are at L-5; let's scoot over, swing around Mars, and come straight home. Just for drill.

Conditions: Earth-surface gravity (one "gee") is an acceleration of 32.2 feet per second squared, or 980.7 centimeters per second squared. Mars is in or near op-

position (Mars is rising as Sun is setting). We will assume that the round trip is 120,000,000 miles. If we were willing to wait for closest approach we could trim that to less than 70,000,000 miles . . . but we might have to wait as long as 17 years. So we'll take a common or garden variety opposition—one every 26 months—for which the distance to Mars is about 50- to 60,000,000 miles and never over 64 million.

(With Mars in conjunction on the far side of the Sun, we could take the scenic route of over 500 million miles—how much over depends on how easily you sunburn. I suggest a minimum of 700 million miles.)

You now have all necessary data to figure the time it takes to travel Earth-Mars-Earth in a constant-boost ship—any constant-boost ship—when Mars is at opposition. (If you insist on the scenic route, you can't treat the trajectory approximations as straight lines and you can't treat space as flat but a bit uphill. You'll need Alderson or his equal and a *big* computer, not a pocket calculator; the equations are very hairy and sometimes shoot back.)

But us two space cadets are doing this by eyeballing it, using Tennessee windage, an aerospace almanac, a Mickey Mouse watch, and an SR-50 Pop discarded years ago.

We need just one equation: Velocity equals acceleration times elapsed time: $v = at$

This tells us that our average speed is $\frac{1}{2}at$ —and from that we know that the distance achieved is the average speed times the elapsed time: $d = \frac{1}{2}at^2$

If you don't believe me, check any physics text, encyclopedia, or nineteen other sorts of reference books—and I did that derivation without cracking a book but now I'm going to stop and find out whether I've goofed—I've had years of practice in goofing. (Later—seems okay.)

Just two things to remember: 1) This is a 4-piecee trip—boost to midpoint, flip over and boost to brake; then do the same thing coming home. Treat all four

legs as being equal or 30,000,000 miles, so figure one of them and multiply by four (Dan, stop frowning; this is an *approximation* . . . done with a Mickey Mouse watch.)

2) You must keep your units straight. If you start with centimeters, you are stuck with centimeters; if you start with feet, you are stuck with feet. So we have $\frac{1}{4}$ of the trip equals $5280 \times 30,000,000 = 1.584 \times 10^{11}$ feet, or 4.827×10^{12} centimeters.

One last bit: Since it is elapsed time we are after, we will rearrange that equation ($d = \frac{1}{2}at^2$) so that you can get the answer in one operation on your trusty-but-outdated pocket calculator . . . or even on a slide rule, as those four-significant-figures data are mere swank; I've used so many approximations and ignored so many minor variables that I'll be happy to get answers correct to two significant figures.

$$\frac{d}{\frac{1}{2}a} = t^2 \text{ This gives us: } t = \sqrt{d/\frac{1}{2}a}$$

d is 30,000,000 miles expressed in feet, or 158,400,000,000. Set that into your pocket calculator. Divide it by one half of one tenth of gee, or 1.61. Push the square root button. Multiply by 4. You now have the elapsed time of the round trip expressed in seconds so divide by 3600 and you have it in hours, and divide that by 24 and you have it in days.

At this point you are supposed to be astonished and to start looking for the mistake. While you are looking, I'm going to slide out to the refrigerator.

There is no mistake. Work it again, this time in metric. Find a reference book and check the equation. You will find the answer elsewhere in this book but don't look for it yet; we'll try some other trips you may take by 2000 A.D. if you speak Japanese or German—or even English if Proxmire and his ilk fail of reelection.

Same trip, worked the same way, but at only one

percent of gee. At that boost I would weigh less than my shoes weigh here in my study.

Hmmph! Looks as if one answer or the other must be wrong.

Bear with me. This time we'll work it at a full gee, the acceleration you experience lying in bed, asleep. (See Einstein's 1905 paper.)

(Preposterous. All three answers must be wrong.)

Please stick with me a little longer. Let's run all three problems for a round trip to Pluto—in 2006 A.D., give or take a year. Why 2006? Because today Pluto has ducked inside the orbit of Neptune and won't reach perihelion until 1989—and I want it to be a bit farther away; I've got a rabbit stashed in the hat.

Pluto ducks outside again in 2003 and by 2006 it will be (give or take a few million miles) 31.6 A.U. from the Sun, figuring an A.U. at 92,900,000 miles or 14,950,000,000,000 centimeters as we'll work this both ways, MKS and English units. (All right, all right— 1.495×10^{13} centimeters; it gets dull here at this typewriter.)

Now work it all three ways, a round trip of 63.2 A.U. at a constant boost of one gravity, one tenth gravity, and one hundredth of a gee—and we'll dedicate this to Clyde Tombaugh, the only living man to discover a new planet—through months of tedious and painstaking examination of many thousands of films. Some jokers have been trying to take the glory off his discovery by claiming that Pluto is an escaped satellite of Neptune. Nonsense! They can't offer a mathematically sound ballistic theory for capture or escape, and the two bodies are utterly unlike.

Pluto is the most mysterious body in the Solar System. Exquisite measurements involving occultation of stars show that Pluto can't be more than 5500 kms in diameter; equally careful measurements of perturbations give it a mass having an average density of 11.7 grams per cubic centimeter. Older astronomers, the same sort who didn't believe Galileo or Einstein or

Michelson and Morley or Copernicus, say, "Duh . . . must be some error in the data."

This is not the scientific attitude. A true scientist will check most carefully data that do not seem to fit . . . while deep in his heart is the merry hope that these wild data conceal a Nobel prize. Earth has an average density of 5.5—so high that we assume that there must be heavy metals in our core.

But 11.7 is *very* high—it means iron, nickel, lead, chromium, gold, uranium, etc. Is it possible that this small planet is the heavy, stripped core of a larger planet, after some catastrophe we cannot yet imagine? (Possibly a cousin to the unknown catastrophe that produced the Asteroids?)

Did Clyde Tombaugh discover the most valuable body in all the Solar System?

This theory I just now whipped up in my own study without benefit of computers, observatories, or fancy degrees (of which I have none). But my theory is at least as sound as the dollar (ugh!) and superior to that of astronomers who say: "Duh . . . must be some mistake—decimal point, maybe."

I would like to see this unassuming Kansas farm boy make the "world authorities" look silly.

Finished? Good. Now turn to page 368 and you will see why I wanted our trip to Pluto to be at a radius vector of 31.6 A.U.—plus some other goodies, I hope.

11. 1950 Your personal telephone will be small enough to carry in your handbag. Your house telephone will record messages, answer simple inquiries, and transmit vision.

1965 No new comment.

1980 This prediction is trivial and timid. Most of it has already come true and the telephone system will hand you the rest on a custom basis if you'll pay for it. In the year 2000, with modern telephones tied into home computers (as common then as flush toilets are today) you'll be able to have 3-dimensional holovision

along with stereo speech. Arthur C. Clarke says that this will do away with most personal contact in business. I agree with all of Mr. Clarke's arguments and disagree with his conclusion; with us monkey folk there is no substitute for personal contact; we enjoy it and it fills a spiritual need.

Besides that, the business conference is often an excuse to loaf on the boss's time and the business convention often supplies some of the benefits of the Roman Saturnalia.

Nevertheless I look forward to holovideostereophones without giving up personal contacts.

12. 1950 Intelligent life will be found on Mars.

1965 Predicting intelligent life on Mars looks pretty silly after those dismal photographs. But I shan't withdraw it until Mars has been *thoroughly* explored. As yet we really have no idea—and no data—as to just how ubiquitous and varied life may be in this galaxy; it is conceivable that life as we *don't* know it can evolve on *any* sort of a planet . . . and nothing in our present knowledge of chemistry rules this out. All the talk has been about life-as-we-know-it—which means terrestrial conditions.

But if you feel that this shows in me a childish reluctance to give up thoats and zitidars and beautiful Martian princesses until forced to, I won't argue with you—I'll just wait.

1980 The photographs made by the Martian landers of 1976 and their orbiting companions make the prediction of intelligent Martian life look even sillier. But the new pictures and the new data make Mars even more mysterious. I'm a diehard because I suspect that life is ubiquitous—call that a religious opinion if you wish. But remember two things: Almost all discussion has been about Life-as-we-know-it . . . but what about Life-as-we-*don't*-know-it? If there were Martians around the time that those amazing gullies and canyons were formed, perhaps they went underground as

their atmosphere thinned. At present, despite wonderful pictures, our data are very sparse; those two fixed landers are analogous to two such landing here: one on Canadian tundra, the other in Antarctica—hardly sufficient to solve the question: Is there intelligent life on Sol III?

(Is there intelligent life in Washington, D.C.?)

Whistling in the dark—I think I goofed on this one. But if in fact Mars is uninhabited, shortly there will be a land rush that will make the Oklahoma land stampede look gentle. Since $E = mc^2$ came into our lives, *all* real estate is potentially valuable; it can be terraformed to suit humans. There has been so much fiction and serious, able nonfiction published on how to terraform Mars that I shan't add to it, save to note one thing:

Power is no problem. Sunshine at that distance has dropped off to about .43% of the maximum here—but Mars gets *all* of it and gets it all day long save for infrequent dust storms . . . whereas the *most* that Philadelphia (and like places) ever gets is .35%—and overcast days are common. Mars won't need solar power from orbit; it will be easier to do it on the ground.

But don't be surprised if the Japanese charge you a very high fee for stamping their visa into your passport plus requiring deposit of a prepaid return ticket or, if you ask for immigrant's visa, charge you a much, much higher fee plus proof of a needed colonial skill.

For there *is* intelligent life in Tokyo.

13. 1950 A thousand miles an hour at a cent a mile will be commonplace; short hauls will be made in evacuated subways at extreme speed.

1965 I must hedge number thirteen; the "cent" I meant was scaled by the 1950 dollar. But our currency has been going through a long steady inflation, and no nation in history has ever gone as far as we have along this route without reaching the explosive phase of inflation. Ten-dollar hamburgers? Brother, we are

headed for the hundred-dollar hamburger—for the barter-only hamburger.

But this is only an inconvenience rather than a disaster as long as there is plenty of hamburger.

1980 I must scale that "cent" again. In 1950 gold was \$35/troy ounce; this morning the London fix was \$374/troy ounce. Just last week my wife and I flew San Francisco to Baltimore and return. We took neither the luxury class nor any of the special discounted fares; we simply flew what we could get.

Applying the inflation factor—35/374—our tickets cost a hair less than one cent a mile in 1950 dollars. From here on I had better give prices in troy ounces of gold, or in Swiss francs; not even the Man in the White House knows where this inflation is going. About those subways: possible, even probable, by 2000 A.D. But I see little chance that they will be financed until the dollar is stabilized—a most painful process our government hates to tackle.

14. 1950 A major objective of applied physics will be to control gravity.

1965 This prediction stands. But today physics is in a tremendous state of flux with new data piling up faster than it can be digested; it is anybody's guess as to where we are headed, but the wilder you guess, the more likely you are to hit it lucky. With "elementary particles" of nuclear physics now totaling about half the number we used to use to list the "immutable" chemical elements, a spectator needs a program just to keep track of the players. At the other end of the scale, "quasars"—quasi-stellar bodies—have come along; radio astronomy is now bigger than telescopic astronomy used to be; and we have redrawn our picture of the universe several times, each time enlarging it and making it more complex—I haven't seen this week's theory yet, which is well, as it would be out of date before this gets into print. Plasma physics was barely started in 1950; the same for solid-state phys-

ics. This is the Golden Age of physics—and it's an anarchy.

1980 I stick by the basic prediction. There is so much work going on both by mathematical physicists and experimental physicists as to the nature of gravity that it seems inevitable that twenty years from now applied physicists will be trying to control it. But note that I said "trying"—succeeding may take a long time. If and when they do succeed, a spinoff is likely to be a spaceship that is in no way a rocket ship—and the Galaxy is ours! (Unless we meet that smarter, meaner, tougher race that kills us or enslaves us or eats us—or all three.)

Particle physics: the situation is even more confusing than in 1965. Physicists now speak of more than 200 kinds of hadrons, "elementary" heavy particles. To reduce this confusion a mathematical construct called the "quark" was invented. Like Jell-O quarks come in many colors and flavors . . . plus spin, charm, truth, and beauty (or top and bottom in place of truth and beauty—or perhaps "truth" doesn't belong in the list, and no jokes, please, as the physicists aren't joking and neither am I). Put quarks together in their many attributes and you can account for (maybe) all those 200-odd hadrons (and have a system paralleling the leptons or light particles as a bonus).

All very nice . . . except that no one has ever been able to pin down even one quark. Quarks, if they exist, come packaged in clumps as hadrons—not at random but by rules to account for each of that mob of hadrons.

Now comes Kenneth A. Johnson, Ph.D. (Harvard '55), Professor of Physics at the Massachusetts Institute of Technology (which certainly places him in the worldwide top group of physicists) with an article (*Scientific American*, July 1979, p. 112, "The Bag Model of Quark Confinement"), an article which appears to state that quarks will never be pinned down because

they are in sort of an eternal purdah, never to be seen even as bubble tracks.

Somehow it reminds me of the dilemma when the snark is a boojum.

I'm not poking fun at Dr. Johnson; he is very learned and trying hard to explain his difficult subject to the unlearned such as I.

But, in the meantime I suggest reading *The Hunting of the Snark* while waiting patiently for 2000 A.D. We have a plethora of data; perhaps in twenty more years the picture will be simplified. Perhaps—

15. 1950 We will not achieve a "World State" in the predictable future. Nevertheless, Communism will vanish from this planet.

1965 I stand flatly behind prediction number fifteen.

1980 I still stand flatly behind the first sentence of that two-part prediction above. The second part I could weasel out of by pointing out that on this planet no state that calls itself Marxist or Socialist or Communist has ever established a system approximating that called for by the works of Karl Marx and Friedrich Engels. And never will; Marx's utopia does not fit human beings. The state will not "wither away."

But I shan't weasel as I am utterly dismayed by the political events of the past 15-20 years. At least two thirds of the globe now calls itself Marxist. Another large number of countries are military dictatorships. Another large group (including the United States) are constitutional democratic republics but so heavily tinged with socialism ("welfare state") that all of them are tottering on the brink of bankruptcy and collapse.

So far as I can see today the only thing that could cause the soi-disant Marxist countries to collapse in as little time as twenty years would be for the United States to be conquered and occupied by the USSR—and twenty years ago I thought that this was a strong possibility. (I'm more optimistic now, under the pres-

ent three-cornered standoff.)

If we were to be conquered and occupied, the Communist world might collapse rather quickly. We have been propping them up whenever they were in real trouble (frequently!) for about half a century.

16. 1950 Increasing mobility will disenfranchise a majority of the population. About 1990 a constitutional amendment will do away with state lines while retaining the semblance.

1965 No further comment.

1980 I goofed. I will be much surprised if either half of this double prediction comes to pass by 2000—at least in the form described and for the reasons I had in mind. The franchise now extends to any warm body over eighteen years of age and that franchise can be transferred to another state in less time than it takes the citizen to find housing in his/her new state.

Thus no constitutional amendment is needed. But the state lines are fading year by year anyhow as power continues to move from the states to the Federal government and especially into the hands of non-elected bureaucrats.

17. 1950 All aircraft will be controlled by a giant radar net run on a continent-wide basis by a multiple electronic "brain."

1965 No further comment.

1980 This prediction still stands—although it may be my wishful thinking. Such a system was designed over thirty years ago; Congress wouldn't buy it. It would be more expensive today . . . and is far more urgently needed. Anyone who has ever been in the tower of a busy field or has ever ridden in the "office" of a commercial plane during a takeoff or landing at a busy field knows what I mean. All our fields are overloaded but anyone who goes in or out of San Diego or of O'Hare-Chicago or—but why go on? Our airplanes are pretty durn wonderful . . . but our method of handling

air traffic at fields is comparable to Manhattan without traffic lights.

I shall continue to fly regularly for two reasons: 1) Mrs. Heinlein and I hope to go out in a common disaster. 2) Consider the alternatives: AMTRAK (ugh!), buses (two ughs!), and driving oneself. The latter is fine for short distances (OPEC and Washington permitting) but, while in my younger days I drove across this continent so many times that I've lost count, today I am no longer physically up to such a trip even with a chauffeur.

But that totally-automated traffic control system *ought* to be built. Expensive, yes—but what price do we place on a hundred dead passengers, a flight crew, and a modern airliner? In the present state of the art in computers and in radar neither the pilot nor the controller should be in the loop at landing or take off; they should simply be alert, ready to override, because even the most perfect machinery is subject to Murphy's Law. But all routine (99.9%) takeoffs and landings should be made by computer.

If this pushes small private planes onto separate and smaller fields, so be it. Bicycles do not belong on freeways. I hate to say that, as there is nothing more fun than a light sports plane.

(Nothing that is not alive, I mean. *Vive la difference!*)

(On air traffic control I speak with a modicum of authority. I returned to the aircraft industry for a short time in 1948 to research this subject, then wrote an article aimed at the slicks: **THE BILLION-DOLLAR EYE**. I missed; it is still unpublished.)

18. 1950 Fish and yeast will become our principal sources of proteins. Beef will be a luxury; lamb and mutton will disappear.

1965 I'll hedge number eighteen a little. Hunger is not now a problem in the USA and need not be in the year 2000—but hunger *is* a world problem and would

at once become an acute problem for us if we were conquered . . . a distinct possibility by 2000. Between our present status and that of subjugation lies a whole spectrum of political and economic possible shapes to the future under which we would share the worldwide hunger to a greater or lesser extent. And the problem grows. We can expect to have to feed around half a billion Americans circa year 2000—our present huge surpluses would then represent acute shortages even if we never shipped a ton of wheat to India.

1980 It would now appear that the USA population in 2000 A.D. will be about 270,000,000 instead of 500,000,000. I have been collecting clippings on demography for forty years; all that the projections have in common is that all of them are wrong. Even that figure of 270,000,000 may be too high; today the only reason our population continues to increase is that we oldsters are living longer; our current birthrate is not sufficient even to replace the parent generation.

19. 1950 Mankind will *not* destroy itself, nor will "Civilization" be destroyed.

1965 I stand by prediction number nineteen.

1980 I still stand by prediction number nineteen. There will be wars and we will be in some of them—and some may involve atomic weapons. But there will *not* be that all-destroying nuclear holocaust that forms the background of so many SF stories. There are three reasons for this: The United States, the Soviet Union, and the People's Republic of China.

Why? Because the three strongest countries in the world (while mutually detesting each the other two) have nothing to gain and everything to lose in an all-out swapping of H-bombs. Because Kremlin bosses are not idiots and neither are those in Beijing (Peiping)(Peking).

If another country—say Israel, India, or the South African Republic—gets desperate and tosses an A- or H-bomb, that country is likely to receive three phone

calls simultaneously, one from each of the Big Three: "You have exactly three minutes to back down. Then we destroy you."

After World War II I never expected that our safety would ever depend on a massive split in Communist International—but that is exactly what has happened.

1950 Here are things we won't get soon, if ever:
Travel through time.

Travel faster than the speed of light.

"Radio" transmission of matter.

Manlike robots with manlike reactions.

Laboratory creation of life.

Real understanding of what "thought" is and how it is related to matter.

Scientific proof of personal survival after death.

Nor a permanent end to war. (I don't like that prediction any better than you do.)

1950 Prediction of gadgets is a parlor trick anyone can learn; but only a fool would attempt to predict details of future history (except as fiction, so labeled); there are too many unknowns and no techniques for integrating them even if they were known.

Even to make predictions about overall trends in technology is now most difficult. In fields where before World War II there was one man working in public, there are now ten, or a hundred, working in secret. There may be six men in the country who have a clear picture of what is going on in science today. *There may not be even one.*

This is in itself a trend. Many leading scientists consider it a factor as disabling to us as the nonsense of Lysenkoism is to Russian technology. Nevertheless there are clear-cut trends which are certain to make this coming era enormously more productive and interesting than the frantic one we have just passed through. Among them are:

Cybernetics: The study of communication and con-

trol of mechanisms and organisms. This includes the wonderful field of mechanical and electronic "brains"—but is not limited to it. (These "brains" are a factor in themselves that will speed up technical progress the way a war does.)

Semantics: A field which seems concerned only with definitions of words. It is not; it is a frontal attack on epistemology—that is to say, *how we know what we know*, a subject formerly belonging to long-haired philosophers.

New tools of mathematics and logic, such as calculus of statement, Boolean logic, morphological analysis, generalized symbology, newly invented mathematics of every sort—there is not space even to name these enormous fields, but they offer us hope in every field—medicine, social relations, biology, economics, anything.

Biochemistry: Research into the nature of protoplasm, into enzyme chemistry, viruses, etc., give hope not only that we may conquer disease, but that we may someday understand the mechanisms of life itself. Through this, and with the aid of cybernetic machines and radioactive isotopes, we may eventually acquire a rigor of chemistry. Chemistry is not a discipline today; it is a jungle. We know that chemical behavior depends on the number of orbital electrons in an atom and that physical and chemical properties follow the pattern called the Periodic Table. We don't know much else, save by cut-and-try, despite the great size and importance of the chemical industry. When chemistry becomes a discipline, mathematical chemists will design new materials, predict their properties, and tell engineers how to make them—without ever entering a laboratory. We've got a long way to go on that one!

Nucleonics: We have yet to find out what makes the atom tick. Atomic power?—yes, we'll have it, in convenient packages—when we understand the nucleus. The field of radioisotopes alone is larger than was the

entire known body of science in 1900. Before we are through with these problems, we may find out how the universe is shaped and *why*. Not to mention enormous unknown vistas best represented by ??????

Some physicists are now using two time scales, the T-scale, and the *tau*-scale. Three billion years on one scale can equal an incredibly split second on the other scale—and yet both apply to you and your kitchen stove. Of such anarchy is our present state in physics.

For such reasons we must insist that *the Age of Science has not yet opened*.

(Still 1950) The greatest crisis facing us is not Russia, not the Atom bomb, not corruption in government, not encroaching hunger, not the morals of young. It is a crisis in the *organization* and *accessibility* of human knowledge. We own an enormous "encyclopedia"—which isn't even arranged alphabetically. Our "file cards" are spilled on the floor, nor were they ever in order. The answers we want may be buried somewhere in the heap, but it might take a lifetime to locate two already known facts, place them side by side and derive a third fact, the one we urgently need.

Call it the Crisis of the Librarian.

We need a new "specialist" who is not a specialist, but a synthesist. We need a new science to be the perfect secretary to all other sciences.

But we are not likely to get either one in a hurry and we have a powerful lot of grief before us in the meantime.

Fortunetellers can always be sure of repeat customers by predicting what the customer wants to hear . . . it matters not whether the prediction comes true. Contrariwise, the weatherman is often blamed for bad weather.

Brace yourself.

In 1900 the cloud on the horizon was no bigger than a man's hand—but what lay ahead was the Panic of 1907, World War I, the panic following it, the Depres-

sion, Fascism, World War II, the Atom Bomb, and Red Russia.

Today the clouds obscure the sky, and the wind that overturns the world is sighing in the distance.

The period immediately ahead will be the roughest, cruelest one in the long, hard history of mankind. It will probably include the worst World War of them all. It might even end with a war with Mars, God save the Mark! Even if we are spared that fantastic possibility, it is certain that there will be no security anywhere, save that which you dig out of your own inner spirit.

But what of that picture we drew of domestic luxury and tranquility for Mrs. Middleclass, style 2000 A.D.?

She lived through it. She survived.

Our prospects need not dismay you, not if you or your kin were at Bloody Nose Ridge, at Gettysburg—or trudged across the Plains. You and I are here because we carry the genes of uncountable ancestors who fought—and won—against death in all its forms. We're tough. We'll survive. Most of us.

We've lasted through the preliminary bouts; the main event is coming up.

But it's not for sissies.

The last thing to come fluttering out of Pandora's Box was Hope—without which men die.

The gathering wind will not destroy everything, nor will the Age of Science change everything. Long after the first star ship leaves for parts unknown, there will still be outhouses in upstate New York, there will still be steers in Texas, and—no doubt—the English will still stop for tea.

Afterthoughts, fifteen years later—(1965)

I see no reason to change any of the negative predictions which follow the numbered affirmative ones. They are all conceivably possible; they are all wildly

unlikely by year 2000. Some of them are debatable if the terms are defined to suit the affirmative side—definitions of "life" and "manlike," for example. Let it stand that I am not talking about an amino acid in one case, or a machine that plays chess in the other.

Today the forerunners of synthesists are already at work in many places. Their titles may be anything; their degrees may be in anything—or they may have no degrees. Today they are called "operations researchers," or sometimes "systems development engineers," or other interim tags. But they are all interdisciplinary people, generalists, not specialists—the new Renaissance Man. The very explosion of data which forced most scholars to specialize very narrowly created the necessity which evoked this new non-specialist. So far, this "unspecialty" is in its infancy; its methodology is inchoate, the results are sometimes trivial, and no one knows how to train to become such a man. But the results are often spectacularly brilliant, too—this new man may yet save all of us.

I'm an optimist. I have great confidence in *Homo sapiens*.

We have rough times ahead—but when didn't we? Things have always been "tough all over." H-bombs, Communism, race riots, water shortage—all nasty problems. But not basic problems, merely current ones.

We have three basic and continuing problems: The problem of population explosion; the problem of data explosion; and the problem of government.

Population problems have a horrid way of solving themselves when they are not solved rationally; the Four Horsemen of the Apocalypse are always saddled up and ready to ride. The data explosion is now being solved, mostly by cybernetics and electronics men rather than by librarians—and if the solutions are less than perfect, at least they are better than what

Grandpa had to work with. The problem of government has not been solved either by the "Western Democracies" or the "Peoples' Democracies," as of now. (Anyone who thinks the people of the United States have solved the problem of government is using too short a time scale.) The peoples of the world are now engaged in a long, long struggle with no end in sight, testing whether one concept works better than another; in that conflict millions have already died and it is possible that hundreds of millions will die in it before year 2000. But not all.

I hold both opinions and preferences as to the outcome. But my personal preference for a maximum of looseness is irrelevant; what we are experiencing is an evolutionary process in which personal preference matters, at most, only statistically. Biologists, ecologists in particular, are working around to the idea that natural selection and survival of the fittest is a notion that applies more to groups and how they are structured than it does to individuals. The present problem will solve itself in the cold terms of evolutionary survival, and in the course of it both sides will make changes in group structure. The system that survives might be called "Communism" or it might be called "Democracy" (the latter is my guess)—but one thing we can be certain of: it will not resemble very closely what either Marx or Jefferson had in mind. Or it might be called by some equally inappropriate neologism; political tags are rarely logical.

For Man is rarely logical. But I have great confidence in Man, based on his past record. He is mean, ornery, cantankerous, illogical, emotional—and amazingly hard to kill. Religious leaders have faith in the spiritual redemption of Man; humanist leaders subscribe to a belief in the perfectibility of Man through his own efforts; but I am not discussing either of these two viewpoints. My confidence in our species lies in its past history and is founded quite as much on Man's so-called vices as on his so-called vir-

tues. When the chips are down, quarrelsomeness and selfishness can be as useful to the survival of the human race as is altruism, and pig-headedness can be a trait superior to sweet reasonableness. If this were not true, these "vices" would have died out through the early deaths of their hosts, at least a half million years back.

I have a deep and abiding confidence in Man as he is, imperfect and often unlovable—plus still greater confidence in his potential. No matter how tough things are, Man copes. He comes up with adequate answers from illogical reasons. But the answers work.

Last to come out of Pandora's Box was a gleaming, beautiful thing—eternal Hope.

(1980—I see no point in saying more. R.A.H.)

I shot an error into the air.
It's still going . . . *everywhere.*

L.Long

AFTERWORD

Santa Claus, Arizona, is still there; just drive from Kingman toward Boulder Dam on 93; you'll find it. But Mrs. Santa Claus (Mrs. Douglas) is no longer there, and her gourmet restaurant is now a fast-food joint. If she is alive, she is at least in her eighties. I don't want to find out. In her own field she was an artist equal to Rembrandt, Michelangelo, and Shakespeare. I prefer to think of her in that perfect place where all perfect things go, sitting in her kitchen surrounded by her gnomes, preparing her hearty ambrosia for Mark Twain and Homer and Praxiteles and others of her equals.

THE ANSWERS (to Problems on Pages 334-338)

N.B.: All trips are Earth parking orbit to Earth parking orbit without stopping at the target planet (Mars or Pluto). I assume that Hot Pilot Tom Corbett will handle his gravity-well maneuvers at Mars and at Pluto so as not to waste mass-energy—but that's his problem. Now about that assumption of "flat space" only slightly uphill: The Sun has a fantastically deep gravity well; its "surface" gravity is 28 times as great as ours and its escape speed is 55+ times as great—but at the distance of Earth's orbit that grasp has attenuated to about one thousandth of a gee, and at Pluto at 31.6 A.U. it has dropped off to a gnat's whisker, one millionth of gee.

(No wonder it takes 2½ centuries to swing around the Sun. By the way, some astronomers seem positively gleeful that *today* Pluto is not the planet farthest from the Sun. The facts: Pluto spends nine-tenths of its time outside Neptune's orbit, and it averages being 875,000,000 miles farther out than Neptune—and at maximum is nearly 2 billion miles beyond Neptune's orbit (1.79×10^9 miles)—friends, that's more than the

distance from here to Uranus, nearly four times as far as from here to Jupiter. When Pluto is out there—1865 or 2114 A.D.—it takes light 6 hours and 50 minutes to reach it. Pluto—the Winnuh and still Champeen! Sour grapes is just as common among astronomers as it is in school yards.)

ROUNDTRIP BOOST		COMPARISON OF ELAPSED TIME
Earth-Mars-Earth		Earth-Pluto-Earth
4.59 days	@ 1 gee vs.	4.59 weeks
14.5 days	@ $\frac{1}{10}$ gee vs.	14.5 weeks
45.9 days	@ $\frac{1}{100}$ gee vs.	45.9 weeks
145 days	@ $\frac{1}{1000}$ gee vs.	145 weeks

—and the rabbit is out of the hat. You will have noticed that the elapsed-time figures are exactly the same in both columns, but in days for Mars, weeks for Pluto—i.e., with constant-boost ships of any sort Pluto is *only 7 times* as far away for these conditions as is Mars even though *in miles Pluto is about 50 times as far away*.

If you placed Pluto at its aphelion (stay alive another century and a quarter—quite possible), at one gee the Pluto round trip would take 5.72 weeks, at $\frac{1}{10}$ gee 18.1 weeks, at $\frac{1}{100}$ gee 57.2 weeks—and at $\frac{1}{1000}$ gee 181 weeks, or 3 yrs & 25 wks.

I have added on the two illustrations at $\frac{1}{1000}$ of one gravity boost because today (late 1979 as I write) we do not as yet know how to build constant-boost ships for long trips at 1 gee, $\frac{1}{10}$ gee, or even $\frac{1}{100}$ gee; Newton's Third Law of Motion (from which may be derived all the laws of rocketry) has us (temporarily) stumped. But only temporarily. There is $E = mc^2$, too, and there are several possible ways of "living off the country" like a foraging army for necessary reaction mass. Be patient; this is all very new. Most of you who read this

will live to see constant-boost ships of $\frac{1}{10}$ gee or better—and will be able to afford vacations in space—soon, soon! I probably won't live to see it, but *you* will. (No complaints, Sergeant—I was born in the horse & buggy age; I have lived to see men walk on the Moon and to see live pictures from the soil of Mars. I've had my share!)

But if you are willing to settle today for a constant-boost on the close order of magnitude of $\frac{1}{1000}$ gee, we can start the project later this afternoon, as there are several known ways of building constant-boost jobs with that tiny acceleration—even light-sail ships.

I prefer to talk about light-sail ships (or, rather, ships that sail in the "Solar wind") because those last illustrations I added ($\frac{1}{1000}$ gee) show that we have the entire Solar System available to us *right now*; it is not necessary to wait for the year 2000 and new breakthroughs.

Ten weeks to Mars . . . a round trip to Pluto at 31.6 A.U. in 2 years and 9 months . . . or a round trip to Pluto's aphelion, the most remote spot we know of in the Solar System (other than the winter home of the comets).

Ten weeks—it took the Pilgrims in the *Mayflower* nine weeks and three days to cross the Atlantic.

Two years and nine months—that was a normal commercial voyage for a China clipper sailing out of Boston in the last century . . . and the canny Yankee merchants got rich on it.

Three years and twenty-five weeks is excessive for the China trade in the 19th century . . . but no one will ever take that long trip to Pluto *because Pluto does not reach aphelion until 2113* and by *then* we'll have ships that can get out there (constant boost with turnover near midpoint) *in three weeks*.

Please note that England, Holland, Spain, and Portugal all created worldwide empires with ships that took as long to get anywhere and back as would a $\frac{1}{1000}$ -gee spaceship. On the high seas or in space it is

not distance that counts but *time*. The magnificent accomplishments of our astronauts up to now were made in free fall and are therefore analogous to floating down the Mississippi on a raft. But even the tiniest constant boost turns sailing the Solar System into a money-making commercial venture.

Now return to page 338.

"Tomorrow we again embark
upon the boundless sea."
—Horace, *Odes*, I, i.

FOREWORD

This polemic was first published on Saturday 12 April 1958. Thereafter it was printed many other places and reprints of it were widely circulated inside and outside the science fiction community, inside and outside this country.

It brought down on me the strongest and most emotional adverse criticism I have ever experienced—not to my surprise.

After more than twenty years my "misdeed" seems to have been largely forgotten, or perhaps forgiven. But I do not ask to be forgiven and I do not want it to be forgotten. So I now republish it in permanent form. I have not consulted my editor or my publisher; each is free to denounce my opinions here expressed—but is not free to refuse this item while accepting the rest of this book.

A few specific details below are outdated by new technology—e.g., earthquakes can now be distinguished with certainty (we hope) from nuclear explosions, while other aspects of detection and inspection grow more complex. Technical details change; basic principles do not.

"Supreme excellence in war is to subdue the enemy without fighting."

—Sun Tzu, ca. 350 B.C.

The Soviet Union is highly skilled at this—and so are the Chinese leaders. During the last twenty-odd years we have been outmaneuvered endlessly. Today it's the Backfire bomber (a B-1 with a Russian accent); tomorrow it is an international (U.N.) treaty to socialize all aspects of space and thereby kill such enterprise as the L-5 Society, Sabre, Otrag (already killed), Robert Truax's Do-It-Yourself projects. The treaty will permit a KGB agent ("A rose by any other name—") to inspect in detail anything of ours, private or public, on the ground or in the sky, if it is in any way connected with space—or the KGB man claims to suspect that it might be.

(But if you think that gives us a free ticket into every

building, every room, at the Byakonur space complex, you don't know how the USSR does business.)

The President has already announced that he will sign it. 10 to 1 he will, 7 to 2 the Senate will pass it—and 100 to 1 we will regret it.

This declaration is more timely than ever; I am proud to reprint it—and deeply sorry that it was ever needed.

Any rational person may well disagree with me on details of this broadside. But on the moral principles expressed here, a free man says: "Give me liberty, or give me death!" No quibbling, no stopping to "think it over." He means it.

Fools and poltroons do not.

Editor's note: Long-time readers of *Destinies* will have no doubt as to whether or not we agree with Mr. Heinlein, or whether or not we would have the nerve to publish—but there's no room; the Foreword and Afterward must stand as proof of our sincerity.



**Being Right Too Soon
Is Socially Unacceptable.**

AFTERWORD

When the soi-disant "SANE" committee published its page ad in Colorado Springs (and many other cities) on 5 April 1958, I was working on THE HERETIC (later to be published as STRANGER IN A STRANGE LAND). I stopped at once and for several weeks Mrs. Heinlein and I did nothing but work on this "Patrick Henry" drive. We published our ad in three newspapers, encouraged its publication elsewhere, mailed thousands of reprints, spoke before countless meetings, collected and mailed to the White House thousands of copies of the letter above—always by registered mail—no acknowledgement of any sort was ever received, not even in response to "Return Receipt Requested."

Then the rug was jerked out from under us; by executive order Mr. Eisenhower canceled all testing without requiring mutual inspection. (The outcome of that is now history; when it suited him, Khrushchev resumed testing with no warning and with the dirtiest bombs ever set off in the atmosphere.)

I was stunned by the President's action. I should not have been as I knew that he was a political general long before he entered politics—stupid, all front, and dependent on his staff. But that gets me the stupid hat, too; I had learned years earlier that many politicians (not all!) will do anything to get elected . . . and Adlai Stevenson had him panting.

Presently I resumed writing—not STRANGER but STARSHIP TROOPERS.

The "Patrick Henry" ad shocked 'em; STARSHIP TROOPERS outraged 'em. I still can't see how that book got a Hugo. It continues to get lots of nasty "fan" mail and not much favorable fan mail . . . but it sells and sells and sells and sells, in eleven languages. It doesn't slow down—four new contracts just this year. And yet I almost never hear of it save when someone wants to chew me out over it. I don't understand it.

The criticisms are usually based on a failure to under-

stand simple indicative English sentences, couched in simple words—especially when the critics are professors of English, as they often are. (A shining counter example, a professor who can read and understand English, is one at Colorado College—a professor of history.)

We have also some professors of English who write science fiction but I do not know of one who formally reviewed or criticized STARSHIP TROOPERS. However, I have gathered a strong impression over the years that professors of English who write and sell science fiction average being much more grammatical and much more literate than their colleagues who do not (cannot?) write saleable fiction.

Their failures to understand English are usually these:

1. "Veteran" does not mean in English dictionaries or in this novel solely a person who has served in military forces. I concede that in commonest usage today it means a war veteran . . . but no one hesitates to speak of a veteran fireman or veteran school teacher. In STARSHIP TROOPERS it is stated flatly and more than once that nineteen out of twenty veterans are not military veterans. Instead, 95% of voters are what we call today "former members of federal civil service."

Addendum: The volunteer is not given a choice. He/she can't win a franchise by volunteering for what we call civil service. He volunteers . . . then for two years plus-or-minus he goes where he is sent and does what he is told to do. If he is young, male, and healthy, he may wind up as cannon fodder. But there are long chances against it.

2. He/she can resign at any time other than during combat—i.e., 100% of the time for 19 out of 20; 99%+ of the time for those in the military branches of federal service.

3. There is no conscription. (I am opposed to conscription for any reason at any time, war or peace, and have said so repeatedly in fiction, in nonfiction, from platforms, and in angry sessions-in think tanks. I was sworn in first in 1923, and have not been off the hook since that

time. My principal pride in my family is that I know of not one in over two centuries who was drafted; they all volunteered. But the draft is involuntary servitude, immoral, and unconstitutional no matter what the Supreme Court says.)

4. Criticism: "The government in STARSHIP TROOPERS is militaristic." "Militaristic" is the adjective for the noun "militarism," a word of several definitions but not one of them can be correctly applied to the government described in this novel. No military or civil servant can vote or hold office until after he is discharged and is again a civilian. The military tend to be despised by most civilians and this is made explicit. A career military man is most unlikely ever to vote or hold office; he is more likely to be dead—and if he does live through it, he'll vote for the first time at 40 or older.

"That book glorifies the military!" Now we are getting somewhere. It does indeed. Specifically the P.B.I., the Poor Bloody Infantry, the mudfoot who places his frail body between his loved home and the war's desolation—but is rarely appreciated. "It's Tommy this and Tommy that and chuck him out, the brute!—but it's 'thin red line of heroes when the guns begin to shoot.' "

My own service usually doesn't have too bad a time of it. Save for very special situations such as the rivers in Nam, a Navy man can get killed but he is unlikely to be wounded . . . and if he is killed, it is with hot food in his belly, clean clothes on his body, a recent hot bath, and sack time in a comfortable bunk not more than 24 hours earlier. The Air Force leads a comparable life. But think of Korea, of Guadalcanal, of Belleau Wood, of Viet Nam. The H-bomb did not abolish the infantryman; it made him essential . . . and he has the toughest job of all and should be honored.

Glorify the military? Would I have picked it for my profession and stayed on the rolls the past 56 years were I not proud of it?

I think I know what offends most of my critics the most about STARSHIP TROOPERS: It is the dismaying idea that a voice in governing the state should be earned instead of being handed to anyone who is 18 years old and has a body temperature near 37°C.

But there ain't no such thing as a free lunch.

Democracies usually collapse not too long after the plebs discover that they can vote themselves bread and circuses . . . for a while. Either read history or watch the daily papers; it is now happening here. Let's stipulate for discussion that some stabilizing qualification is needed (in addition to the body being warm) for a voter to vote responsibly with proper consideration for the future of his children and grandchildren—and yours. The Founding Fathers never intended to extend the franchise to everyone; their debates and the early laws show it. A man had to be a stable figure in the community through owning land or employing others or engaged in a journeyman trade or something.

But few pay any attention to the Founding Fathers today—those ignorant, uneducated men—they didn't even have television (have you looked at Monticello lately?)—so let's try some other "poll taxes" to insure a responsible electorate:

a) Mark Twain's "The Curious Republic of Gondor"—if you have not read it, do so.

b) A state where anyone can buy for cash (or lay-away installment plan) one or more franchises, and this is the government's sole source of income other than services sold competitively and non-monopolistically. This would produce a new type of government with several rabbits tucked away in the hat. Rich people would take over the government? Would they, now? Is a wealthy man going to impoverish himself for the privilege of casting a couple of hundred votes? Buying an election today, under the warm-body (and tombstone) system is much cheaper than buying a controlling number of franchises would be. The arithmetic on this one becomes unsolv-

able . . . but I suspect that paying a stiff price (call it 20,000 Swiss francs) for a franchise would be even less popular than serving two years.

c) A state that required a bare minimum of intelligence and education—e.g., step into the polling booth and find that the computer has generated a new quadratic equation just for you. Solve it, the computer unlocks the voting machine, you vote. But get a wrong answer and the voting machine fails to unlock, a loud bell sounds, a red light goes on over that booth—and you slink out, face red, you having just proved yourself too stupid and/or ignorant to take part in the decisions of the grownups. Better luck next election! No lower age limit in this system—smart 12-yr-old girls vote every election while some of their mothers—and fathers—decline to be humiliated twice.

There are endless variations on this one. Here are two: Improving the Breed—No red light, no bell . . . but the booth opens automatically—empty. Revenue—You don't risk your life, just some gelt. It costs you a $\frac{1}{4}$ oz troy of gold in local currency to enter the booth. Solve your quadratic and vote, and you get your money back. Flunk—and the state keeps it. With this one I guarantee that no one would vote who was not interested and would be most unlikely to vote if unsure of his ability to get that hundred bucks back.

I concede that I set the standards on both I.Q. and schooling too low in calling only for the solution of a quadratic since (if the programming limits the machine to integer roots) a person who deals with figures at all can solve that one with both hands behind him (her) and her-his eyes closed. But I just recently discovered that a person can graduate from high school in Santa Cruz with a straight-A record, be about to enter the University of California on a scholarship . . . but be totally unable to do simple arithmetic. Let's not make things too difficult at the transition.

d) I don't insist on any particular method of achieving a responsible electorate; I just think that we need to

tighten up the present warm-body criterion before it destroys us. How about this? For almost a century and a half women were not allowed to vote. For the past sixty years they have voted . . . but we have not seen the enormous improvement in government that the suffragettes promised us.

Perhaps we did not go far enough. Perhaps men are still corrupting government . . . so let's try the next century and a half with males disenfranchised. (Fair is fair. My mother was past forty before she was permitted to vote.) But let's not stop there; at present men outnumber women in elective offices, on the bench, and in the legal profession by a proportion that is scandalous.

Make males ineligible to hold elective office, or to serve in the judiciary, elective or appointed, and also reserve the profession of law for women.

Impossible? That was exactly the situation the year I was born, but male instead of female, even in the few states that had female suffrage before the XIXth Amendment, with so few exceptions as to be unnoticed. As for rooting male lawyers out of their cozy niches, this would give us a pool of unskilled manual laborers—and laborers are very hard to hire these days; I've been trying to hire one at any wages he wants for the past three months, with no success.

The really good ones could stay on as law clerks to our present female lawyers, who will be overworked for a while. But not for long. Can you imagine female judges (with no male judges to reverse them) permitting attorneys to take six weeks to pick a jury? Or allowing a trial to ramble along for months?

Women are more practical than men. Biology forces it on them.

Speaking of that, let's go whole hog. Until a female bears a child her socio-economic function is male no matter how orthodox her sexual preference. But a woman who is mother to a child knows she has a stake in the future. So let's limit the franchise and eligibility for office and the practice of law to mothers.

The phasing over should be made gentle. Let males serve out their terms but not succeed themselves. Male lawyers might be given as long as four years to retire or find other jobs while not admitting any more males into law schools. I don't have a candidate for President but the events of the last fifty years prove that anybody can sit in the Oval Office; it's just that some are more impressive in appearance than others.

Brethren and Sistern, have you ever stopped to think that there has not been one rational decision out of the Oval Office for fifty years?

An all-female government could not possibly be worse than what we have been enduring. Let's try it!

“I have sworn upon the altar of God
eternal hostility against every form
of tyranny over the mind of man.”

—Thomas Jefferson—1800 A.D.

FOREWORD

After I got STARSHIP TROOPERS out of the way, I indulged in some stone masonry (my favorite recreation and reconditioning after writing when I was younger), installed a fountain in our lower irrigation pool and landscaped it—then got back to work on THE HERETIC aka STRANGER IN A STRANGE LAND, and finally finished it more than ten years after I had plotted it. I had been in no hurry to finish it, as that story could not be published commercially until the public mores changed. I could see them changing and it turned out that I had timed it right.

Many people have said that it is clear that STRANGER was written in two parts; the division point showed. But no two people have ever picked the same putative division point . . . and this is the first time I have ever admitted that it was not written in two chunks but in four.

No one ever will spot the actual starts and stops because STRANGER is one of the very few stories in which I plotted every detail before writing it, and then stuck precisely to that plot. What readers pick as places where I "must have" broken the writing are in fact division points planned for dramatic reasons.

Then I had to cut the damned thing; sticking to that complex and ponderous plot resulted in a MS more than twice as long as it should have been, either commercially or dramatically. Cutting it took more working time than writing it.

In the meantime my wife signed up for University of Colorado Extension classes in Russian. She has always believed that anything worth doing at all is worth overdoing; for two solid years she lived and breathed Russian. She never missed a class, was always thoroughly prepared, hired a private conversation tutor to supplement her classroom work, bought every brand of Russian language instruction records available then, kept them stacked on the record changer and played them all day

long while she did other things—our home had a speaker in every room, and a large speaker for the garden.

(This did not bother my work; since I knew no Russian then, it was random noise to me.)

Two years of this and she could read Russian, write Russian, speak Russian, understand Russian—and think in Russian.

Then we went to the USSR.

Other countries, too, of course—Poland and Czechoslovakia won my undying sympathy, as well as the captive Baltic states. I should include the Turkestan countries, too, but they don't seem quite as oppressed—much farther from Moskva and off the beaten track. All in all we traveled about 10,000 miles inside USSR and saw about twenty cities. Ginny's hard work paid off; we saw and heard far, far more than we could have learned had we been dependent on a politically-cleared guide—we often ducked out without our guide. I picked up some pidgin Russian but never learned to speak it—I could give directions, ask directions, order a meal, pay a bill—and swear in Russian (essential!).

The article below I wrote in Hotel Torni, Helsinki, immediately after "escaping" (that's how it felt) from the Soviet Union. The lighter article following "PRAVDA" I wrote a couple of weeks later in Stockholm. By then my nerves had relaxed in the free air of Scandinavia and I could see humor in things that had not seemed at all funny at the time.

Editor's note: I would also happily break our first-publication rule for "'Pravda' Means 'Truth'" and "Inside Intourist"; not only are both pieces vastly entertaining and edifying, but surely no more than one percent of the *Destinies* audience has read either of them. But space does not permit—the Forewords and Afterword will give you some idea of what you're missing...and the book will be available this fall...

FOREWORD

"Don't Go To Russia If You Expect Tidy Toilets" is the heading on an article by H. Marlin Landwehr (Newspaper Enterprise Association) in the Santa Cruz SENTINEL, Sunday, December 2, 1979. "Russian toilets," writes Mr. Landwehr, "are uniformly filthy, with no toilet seats, coarse (if any) toilet paper, and extremely low pressure."

From this and from many recent (1979) personal reports I know that my 1960 article *INSIDE INTOURIST* is still timely despite minor changes. Intourist still has three classes of travel: Bad—Worse—Horrible. These are now called: "Deluxe Suite, Deluxe, and First Class"—i.e., "First Class" is in fact third class—an Orwellian *pravda*.

Dirty toilets and bad food explain themselves; relative prices are harder to make clear, as the 1960 prices I cite as being outrageously high seem like bargain prices in 1979. So I must adjust for inflation, not too easy when dealing with four sorts of currency: 1) the 1960 dollar fully convertible to gold in the world market at \$35 = 1 troy ounce of fine gold; 2) the 1979 floating dollar having today, 3 December 1979, a price per troy ounce of fine gold on the world market of \$432 and some odd cents; 3) the 1960 western-tourist ruble, a currency not traded (= "blocked") in the world market, not convertible, not spendable outside its own country, and having its official rate set by decree and in direct consequence a very different black market (= free market) rate; and 4) the 3-Dec-79 western-tourist ruble, a blocked currency not equivalent to the 1960 western-tourist ruble.

To define the relationships between a fully-convertible gold currency, a floating currency, and two different blocked currencies is a task that causes headaches. The arithmetic is simple, the semantic problem is not, and it is further complicated by both conscious and subconscious personal attitudes. You may not "believe in" a gold standard, for example (and I readily concede the

truth of the old saw that one cannot eat gold), but it does not matter what I believe or you believe, our floating dollar is now worth in gold whatever the rest of the world tells us it is worth, i.e., the price at which they will buy dollars or sell gold. The only yardstick I can apply to all four currencies is the troy ounce of fine gold (= 480 grains in both troy and avoirdupois, or 31.1035 grams in metric).

Since the ruble is not traded in the gold market, I must equate rubles first in dollars, then translate into gold. (This fiscal discussion is not my idea; our editor complained—correctly—that a much shorter discussion was unclear.) In 1960 the Kremlin-decreed rate was 4 rubles = \$1.00 USA. Today Monday 3 December 1979 the Kremlin-decreed rate to U.S. tourists is 1 ruble = \$1.52 USA.

Now to work—

In 1960 \$1.00 USA equalled

*1/35 tr. oz. Au. = 13.715 grains = 0.888671+ grams gold,
and one ruble equalled \$0.25, or*

1/140 tr. oz. Au. = 3.429 grains = 0.222167+ grams gold.

While on Dec. 3, 1979, \$1.00 USA equalled

*1/432 tr. oz. Au. = 1.1111... grains = 0.071998+ grams gold
and one ruble equalled \$1.52 USA, or*

0.003518+ tr. oz. Au. = 1.7 grains = 0.109438+ grams gold.

—which doesn't tell us much, especially as the dollar floats and changes every day; and the ratio between the dollar and the U.S.-tourist ruble is by decree and subject to change without notice. In the following article I show all prices three ways: 1) 1960 prices; 2) 3-Dec-79 equivalent by world free-market conversion; and 3) 3-Dec-79 equivalent by Kremlin-decreed dollar/ruble ratio.

The conversion factor for the world free market is 432/35 = 12.343; the Kremlin-decreed conversion factor is 152¢/25¢ = 6.08. You are free to believe either one or neither.

But the above still doesn't tell you very much as the

floating dollar changes daily and the ruble/dollar ratio changes whenever the Kremlin changes it . . . and you will not be reading this on December 3, 1979. But all is not lost; you can obtain and apply the conversion factors for the day you read this in the same fashion in which I did it:

For the world free-market conversion factor first get that day's gold fix from newspaper or radio, then divide by 35. For the Kremlin factor telephone a Soviet consulate or Intourist New York, get the current price of a ruble in dollars and cents, divide by 25¢. Then reach for your pocket calculator.

It would have been simpler to state that travel in USSR in 1960 was extremely, outrageously expensive—a planned swindle.



The Early Worm Deserves the Bird

AFTERWORD

After twenty years it would seem logical for me to return to the USSR to see what improvements, if any, they have made in handling tourism. I could plead age and health but I shan't—one trip to USSR is educational; twice is masochism.

If you have been to the USSR recently and if you know enough Russian that you could and did slip the leash occasionally and poke around and get acquainted without permission of Intourist, please write to me and tell me about it—what you saw with your own eyes, what you touched, what you counted, how you were treated. I am not interested in second-hand reports, not even from other Americans you trust, and I most emphatically am not interested in anything your guides told you.

If you know no Russian and took one of the standard Intourist trips—around the Black Sea, or the Leningrad-Moskva-Sochi trip—don't waste your time writing. I hope you had fun.

If you took the long railway trip, Vladivostok to Leningrad or Moskva—or vice versa—do please write to me. If you knew no Russian at first, I'm betting high odds that you spoke fluent (if ungrammatical) Russian long before you completed the trip. You will know many things I don't know as I have never been across Siberia. Alma Ata, KSSR, north of the Himalayas and just short of Sinkiang, is as far as I got.

Concerning believing what you see and ignoring reports: *In thirty-odd years of habitual travel, Mrs. Heinlein and I have not been simply sightseeing; we have been studying other people's ways. Sometimes trivia—e.g., in Peru they make far better apple pie than Mom ever baked (treason!), Chile has us beat all hollow when it comes to ice-cream sodas, and the Finnish ice-cream cone is a work of art that makes what we call an ice-cream cone look sad.*

But usually we are dead serious. Lately I've been making a global survey of blood services—but that is another

story. Two things we have done consistently throughout the world: 1) See the slums; 2) evaluate the diet.

The fancy hotels and the museums and the parks are much the same the world over—but the slums are honest criteria even though a traveller can't assign a numerical value. The street people of Bombay and of Calcutta tell far more about India than does the glorious Taj Mahal.

Two other questions give direct, numerical comparisons: Q: How many long tonnes of protein (meat, fish, cheese) does this country consume in one year? (Then, privately, divide by the population.) Q: How many minutes must a journeyman carpenter work to earn enough to buy one kilogram of the local standard bread?

The first question tells the quality of the average diet; the second tells you how rich (or poor) that country averages. If you have also managed to see the slums, you have some idea of the range of wealth. You can't tell by looking at the extremely wealthy; all over the world they are careful to dress like upper middle class, no higher. But slums are honest and the most extreme wealth range is to be found in India.

The range of personal wealth in Russia, in 1960, was high, possibly greater than the range in the U.S.A. But the range showed in "perks," not in money—privately-assigned automobiles and chauffeurs, summer houses, assigned living quarters. The Latvian Secretary (a Russian, not a Lett) of the Writers Union had as his offices a marble palace, extremely ornate inside and outside and loaded with sculpture and paintings (built—I was told—by the late Tsar for his favorite mistress. True? I don't know but I've never been in a more lavish palace and I have been in many). After meeting his colleagues—and living through a Russian drinking duel better left undescribed—we were taken by him out to the Baltic and shown his dacha . . . thereby showing us that he had a private car, a chauffeur, and a summer home, as well as offices literally fit for a king. No mention of money, no need to—I was convinced that he was not going home to a meal of black bread, potatoes, and boiled cabbage.

Yet he was merely writer boss in Latvia, a small captive country—not General Secretary of the Writers Union in Moskva. I was in the Writers Union general headquarters in Moskva, a large office building; I did not meet the General Secretary. I assume that he lived at least as well as his stooge in Latvia.

How many levels are there between this minor boss in Riga and the members of the Praesidium? How well does Khrushchev—excuse me; Brezhnev—live? I shan't guess.

In the USSR it was not politic (risky) to ask the two key questions that I always asked in other countries, and seeing slums was forbidden. Twice we saw slums by accident, were hurried on past—primitive log cabins just outside Moskva, 1st century mud huts in Alma Ata that were concealed by screening but from one elevation we could see over the screening . . . until we were seen and cautioned not to stop there and not to take pictures.

Since we couldn't ask our standard comparison questions, Mrs. Heinlein devised some "innocent" ones, and I concentrated on certain signs; both of us were sizing up population. At that time the USSR claimed a population of 225,000,000 and claimed a population for Moskva of 5,000,000+. (Today, twenty years later, they claim almost 300,000,000 and over 7,000,000.)

For many days we prowled Moskva—by car, by taxi when we did not want Intourist with us, by subway, by bus, and on foot. In the meantime Mrs. Heinlein, in her fluent Russian, got acquainted with many people—Intourist guides, drivers, people who picked us up on the streets, chambermaids, anyone. The Russians are delightful people, always happy to talk with visitors, in English if they know it (and many do), in Russian if they do not.

Let me add that, if it suited her, Ginny could charm pictures off a wall.

She was able to ask personal questions (but ones people anywhere usually are pleased to answer) by freely answering questions about us and showing warm interest

in that person—not faked; she is a warm person.

But, buried in chitchat, she always learned these things:

How old are you?

Are you married?

How many children do you have?

How many brothers and sisters do you have? What ages?

How many nieces and nephews do you have?

Put baldly, that sounds as offensive as a quiz by a Kinsey reporter. But it was not put baldly—e.g., "Oh, how lucky you are! Gospodin Heinlein and I didn't even meet until the Great Patriotic War . . . and we have no children although we wanted them. But we have lots of nieces and nephews." Etc., etc. She often told more than she got but she accumulated, painlessly, the data she wanted, often without asking questions.

One day we were seated on a park bench, back of the Kremlin and facing the Moskva river, with no one near us—a good spot to talk; a directional mike would have to be clear across the river as long as we kept our backs to the Kremlin.

I said, "How big does that guide book say this city is?"

"Over five million."

"Hmmpf! Look at that river. Look at the traffic on it." (One lonely scow—) "Remember the Rhine?" We had taken a steamer up the Rhine three years earlier; the traffic was so dense the river had traffic lights on it, just like the Panama Canal. "Ginny, this dump isn't anything like five million. More the size of Copenhagen, if that. Pittsburgh. New Orleans. San Francisco, possibly." (These are all cities I know well, on foot and by every form of transportation. In 1960 all of them were in the 600,000–800,000 range.) "Yet they are trying to tell us that this dump is bigger than Philadelphia, bigger than Los Angeles, bigger than Chicago. Nonsense."

(I have lived in all three cities. A big city feels big, be it Yokohama or New York.) "Three quarters of a million, not five million."

"I know," she agreed.

"Huh?"

(*I think I must mention that Mrs. Heinlein is a close student of Russian history, history of the Russian Revolution, history of the Third International or ComIntern, and so skilled in Marxist dialectical materialism that she can argue theory with a Russian party member and get him so mixed up that he's biting his own tail.*)

She answered, "They claim to have finished the War with about two hundred million and Moscow at four million. Now they are claiming twenty-five million more in the Union, and over a million increase in Moscow." She thought a bit. "It's a lie. Unless they are breeding like flies everywhere outside Moscow, they have lost population since the War—not gained. I haven't found even one family with more than three children. The average is less than two. And they marry late. Robert, they aren't even replacing themselves."

She looked at that empty river. "Not quite as big as Copenhagen is my guess."

We stopped in many other cities—Alma Ata, Tashkent, Samarkand, Minsk, Vilno, Kiev, Riga, Leningrad, etc.—and she continued her gentle questioning but never found reason to change her opinion. Even out in the Muslim countries of Turkestan the birthrate was low, or the answers seemed to show it. She did not write down her figures (Well, I don't think she did; I warned her not to) but she has a memory that is effectively perfect as long as necessary . . . then she can wash out useless details, which I can't do.)

How was it possible for the Russians to claim that Moscow was seven times as big as it actually was? How could I be right and the whole world wrong? The World Almanac gave the same figures the Russians did, all news services seemed to accept Russian population figures—how could a Big Lie that big not be noticed—and denounced?

About a year later I had a chance to discuss it with an old shipmate, an admiral now retired but then holding a

major command. I asked him how many people there were in Moscow.

He answered, "I don't know. Why don't you look it up?" (When a high brass answers, "I don't know," he may mean, "Don't be nosy and let's change the subject." But I persisted.)

"Make a guess. You must have some idea."

"Okay." He closed his eyes and kept quiet for several minutes. "Seven hundred and fifty thousand, not over that."

(Jackpot!)

I said, "Mister Ought Ought Seven, have you made a special study of Russia? Or shouldn't I ask?"

"Not at all. [His command] gives me all the trouble I need without worrying about Russia. I simply worked it as a logistics problem, War College style. But I had to stop and visualize the map first. Roads, rivers, railroads, size of marshalling yards, and so forth. You know." (I did, vaguely. But I wasn't a War College graduate. He is.) "That city just doesn't have the transportation facilities to be any bigger than that. Get much over three quarters of a million and they'd starve. Until they double their tracks and increase their yards they can't risk a bigger population. You don't do that over night. They can pick up some slack with the river—but it doesn't go where they need it most."

And there it stands. Either all three of us are crazy despite the fact that all three of us got the same answer to a numerical question using three entirely different but logical methods . . . or for many, many years the Kremlin lie factory has peddled their biggest and fanciest "Pravda" without ever being questioned.

Look—both the Pentagon and the State Department know exactly how big Moscow is, and the Kremlin knows that they know. We were high-flying 'em with the U-2 for four years; you can bet Moscow was carefully photographed many times. Our present Eye-in-the-Sky satellites are so sharp-eyed that they can come close to reading the license plate on your car; our top officials

know precisely what the logistics situation is for Moscow—and every economist knows that one of the parameters that controls strictly the upper limit to the size of a city is how many tons of food it can ship in, week in and week out, never failing. Most big cities are only a day or two away from hunger, only a week or so away from beginning starvation and panic.

Moscow isn't even a seaport; she's a riverport and not a good one. Most food must come overland by train or lorry.

Maybe she's built enough more facilities since 1960 . . . but in 1960 she just didn't have what it takes. Since I can't believe the 5,000,000+ figure for 1960, I don't believe the 7,000,000+ figure for this year.

I have one very wild theory. Our State Department may see no advantage in calling them liars on this point. Through several administrations we have been extremely careful not to hurt their feelings. I think this is a mistake . . . but I am neither president nor secretary of state; my opinion is not important and may be wrong.

("'But the Emperor is not wearing any clothes,' said the child.")

The three biggest lies in the USA today:

- 1) The check is in the mail.
- 2) I gave at the office.
- 3) (Big, cheery smile) "Hello! I'm from Washington. I'm here to help you!"

—Anon.

FOREWORD

On 5 April 1973 I delivered the James Forrestal Memorial Lecture to the Brigade of Midshipmen at my alma mater the United States Naval Academy. As the first half of the lecture, at the request of the midshipmen, I discussed freelance writing. This is the second half:

On This Site
The Afternoon of June 5th, 1834
Nothing of Any Importance Happened



THE PRAGMATICS OF PATRIOTISM

In this complex world, science, the scientific method, and the consequences of the scientific method are central to everything the human race is doing and to wherever we are going. If we blow ourselves up we will do it by misapplication of science; if we manage to keep from blowing ourselves up, it will be through intelligent application of science. Science fiction is the only form of fiction which takes into account this central force in our lives and futures. Other sorts of fiction, if they notice science at all, simply deplore it—an attitude very chichi in the anti-intellectual atmosphere of today. But we will never get out of the mess we are in by wringing our hands.

Let me make one flat-footed prediction of the science-fiction type. Like all scenarios this one has assumptions—variables treated as constants. The primary assumption is that World War Three will hold off long enough—ten, twenty, thirty years—for this prediction to work out . . . plus a secondary assumption that the human race will not find some other way to blunder into ultimate disaster.

Prediction: In the immediate future—by that I mean in the course of the naval careers of the class of '73—there will be nuclear-powered, constant-boost spaceships—ships capable of going to Mars and back in a

couple of weeks—and these ships will be armed with Buck-Rogersish death rays. Despite all treaties now existing or still to be signed concerning the peaceful use of space, these spaceships will be used in warfare. Space navies will change beyond recognition our present methods of warfare and will control the political shape of the world for the foreseeable future. Furthermore—and still more important—these new spaceships will open the Solar System to colonization and will eventually open the rest of this Galaxy.

I did *not* say that the United States will have these ships. The present sorry state of our country does not permit me to make such a prediction. In the words of one of our most distinguished graduates in his *The Influence of Sea Power on History*: "Popular governments are not generally favorable to military expenditures, however necessary—"

Every military officer has had his nose rubbed in the wry truth of Admiral Mahan's observation. I first found myself dismayed by it some forty years ago when I learned that I was expected to maintain the ship's battery of USS ROPER in a state of combat readiness on an allowance of less than a dollar a day—with World War Two staring down our throats.

The United States is capable of developing such spaceships. But the mood today does not favor it. So I am unable to predict that we will be the nation to spend the necessary R&D money to build such ships.

(Addressed to a plebe midshipman:)

Mister, how long is it to graduation?

Sixty-two days? Let's make it closer than that. I have . . . 7.59, just short of eight bells. Assuming graduation for ten in the morning that gives . . . 5,220,860 seconds to graduation . . . and I have less than 960 seconds in which to say what I want to say.

(To the Brigade at large:)

Why are you here?

(To a second plebe:)

Mister, why are *you* here?

Never mind, son; that's a rhetorical question. You are here to become a naval officer. That's why this Academy was founded. That is why all of you are here: to become naval officers. If that is *not* why *you* are here, you've made a bad mistake. But I speak to the overwhelming majority who understood the oath they took on becoming midshipmen and look forward to the day when they will renew that oath as commissioned officers.

But why would anyone want to become a naval officer?

In the present dismal state of our culture there is little prestige attached to serving your country; recent public opinion polls place military service far down the list.

It can't be the pay. No one gets rich on Navy pay. Even a 4-star admiral is paid much less than top executives in other lines. As for lower ranks the typical naval officer finds himself throughout his career just catching up from the unexpected expenses connected with the last change of duty when another change of duty causes a new financial crisis. Then, when he is about fifty, he is passed over and retires . . . but he can't really retire because he has two kids in college and one still to go. So he has to find a job . . . and discovers that jobs for men his age are scarce and usually don't pay well.

Working conditions? You'll spend half your life away from your family. Your working hours? "Six days shalt thou work and do all thou art able; the seventh the same, and pound on the cable." A forty-hour week is standard for civilians—but not for naval officers. You'll work that forty-hour week but that's just a starter. You'll stand a night watch as well, and duty weekends. Then with every increase in grade your hours get longer—until at last you get a ship of your own and no longer stand watches. Instead you are on duty twenty-four hours a day . . . and you'll sign your

night order book with: "In case of doubt, do not hesitate to call me."

I don't know the average week's work for a naval officer but it is closer to sixty than to forty. I'm speaking of peacetime, of course. Under war conditions it is whatever hours are necessary—and sleep you grab when you can.

Why would anyone elect a career which is unappreciated, overworked, and underpaid? It can't be just to wear a pretty uniform. There has to be a better reason.

As one drives through the bushveldt of East Africa it is easy to spot herds of baboons grazing on the ground. But not by looking at the ground. Instead you look up and spot the lookout, an adult male posted on a limb of a tree where he has a clear view all around him—which is why you can spot him; he has to be where he can see a leopard in time to give the alarm. On the ground a leopard can catch a baboon . . . but if a baboon is warned in time to reach the trees, he can out-climb a leopard.

The lookout is a young male assigned to that duty and there he will stay, until the bull of the herd sends up another male to relieve him.

Keep your eye on that baboon; we'll be back to him.

Today, in the United States, it is popular among self-styled "intellectuals" to sneer at patriotism. They seem to think that it is axiomatic that any civilized man is a pacifist, and they treat the military profession with contempt. "Warmongers"—"Imperialists"—"Hired killers in uniform"—you have all heard such sneers and you will hear them again. One of their favorite quotations is: "Patriotism is the last refuge of a scoundrel."

What they never mention is that the man who made that sneering wisecrack was a fat, gluttonous slob who was pursued all his life by a pathological fear of death.

I propose to prove that that baboon on watch is mor-

ally superior to that fat poltroon who made that wise-crack.

Patriotism is the most practical of all human characteristics.

But in the present decadent atmosphere patriots are often too shy to talk about it—as if it were something shameful or an irrational weakness.

But patriotism is *not* sentimental nonsense. Nor something dreamed up by demagogues. Patriotism is as necessary a part of man's evolutionary equipment as are his eyes, as useful to the race as eyes are to the individual.

A man who is *not* patriotic is an evolutionary dead end. This is not sentiment but the hardest sort of logic.

To prove that patriotism is a necessity we must go back to fundamentals. Take any breed of animal—for example, *tyrannosaurus rex*. What is the most basic thing about him? The answer is that *tyrannosaurus rex* is dead, gone, extinct.

Now take *homo sapiens*. The first fact about him is that he is not extinct, he is alive.

Which brings us to the second fundamental question: Will *homo sapiens* stay alive? Will he survive?

We can answer part of that at once: Individually *h. sapiens* will *not* survive. It is unlikely that anyone here tonight will be alive eighty years from now; it approaches mathematical certainty that we will all be dead a hundred years from now as even the youngest plebe here would be 118 years old then—if still alive.

Some men do live that long but the percentage is so microscopic as not to matter. Recent advances in biology suggest that human life may be extended to a century and a quarter, even a century and a half—but this will create more problems than it solves. When a man reaches my age or thereabouts, the last great service he can perform is to die and get out of the way of younger people.

Very well, as individuals we all die. This brings us

to the second half of the question: Does homo sapiens as a breed have to die? The answer is: No, it is not unavoidable.

We have two situations, mutually exclusive: Mankind surviving, and mankind extinct. With respect to morality, the second situation is a null class. An extinct breed has no behavior, moral or otherwise.

Since survival is the sine qua non, I now define "moral behavior" as "behavior that tends toward survival." I won't argue with philosophers or theologians who choose to use the word "moral" to mean something else, but I do not think anyone can define "behavior that tends toward extinction" as being "moral" without stretching the word "moral" all out of shape.

We are now ready to observe the hierarchy of moral behavior from its lowest level to its highest.

The simplest form of moral behavior occurs when a man or other animal fights for his own survival. Do not belittle such behavior as being merely selfish. Of course it is selfish . . . but selfishness is the bedrock on which all moral behavior starts and it can be immoral only when it conflicts with a higher moral imperative. An animal so poor in spirit that he won't even fight on his own behalf is already an evolutionary dead end; the best he can do for his breed is to crawl off and die, and not pass on his defective genes.

The next higher level is to work, fight, and sometimes die for your own immediate family. This is the level at which six pounds of mother cat can be so fierce that she'll drive off a police dog. It is the level at which a father takes a moonlighting job to keep his kids in college—and the level at which a mother or father dives into a flood to save a drowning child . . . and it is still moral behavior even when it fails.

The next higher level is to work, fight, and sometimes die for a group larger than the unit family—an extended family, a herd, a tribe—and take another look at that baboon on watch; he's at that moral level. I don't think baboon language is complex enough to

permit them to discuss such abstract notions as "morality" or "duty" or "loyalty"—but it is evident that baboons *do* operate morally and *do* exhibit the traits of duty and loyalty; we see them in action. Call it "instinct" if you like—but remember that assigning a name to a phenomenon does not explain it.

But that baboon behavior can be explained in evolutionary terms. Evolution is a process that never stops. Baboons who fail to exhibit moral behavior do not survive; they wind up as meat for leopards. Every baboon generation has to pass this examination in moral behavior; those who bilge it don't have progeny. Perhaps the old bull of the tribe gives lessons . . . but the leopard decides who graduates—and there is no appeal from his decision. We don't have to understand the details to observe the outcome: Baboons behave morally—for baboons.

The next level in moral behavior higher than that exhibited by the baboon is that in which duty and loyalty are shown toward a group of your own kind too large for an individual to know all of them. We have a name for that. It is called "patriotism."

Behaving on a still higher moral level were the astronauts who went to the Moon, for their actions tend toward the survival of the entire race of mankind. The door they opened leads to the hope that *h. sapiens* will survive indefinitely long, even longer than this solid planet on which we stand tonight. As a direct result of what they did, it is now possible that the human race will *never die*.

Many short-sighted fools think that going to the Moon was just a stunt. But the astronauts knew the meaning of what they were doing, as is shown by Neil Armstrong's first words in stepping down onto the soil of Luna: "One small step for a man, one giant leap for mankind."

Let us note proudly that eleven of the Astronaut Corps are graduates of this our school.

And let me add that James Forrestal was the *first*

high-ranking Federal official to come out flatly for space travel.

I must pause to brush off those parlor pacifists I mentioned earlier . . . for they contend that *their* actions are on this highest moral level. They want to put a stop to war; they say so. Their purpose is to save the human race from killing itself off; they say that too. Anyone who disagrees with them must be a blood-thirsty scoundrel—and they'll tell you that to your face.

I won't waste time trying to judge their motives; my criticism is of their mental processes: Their heads aren't screwed on tight. They live in a world of fantasy.

Let me stipulate that, if the human race managed its affairs sensibly, we could do without war.

Yes—and if pigs had wings, they could fly.

I don't know what planet those pious pacifists are talking about but it can't be the third one out from the Sun. Anyone who has seen the Far East—or Africa—or the Middle East—knows or certainly should know that there is *no* chance of abolishing war in the foreseeable future. In the past few years I have been around the world three times, traveled in most of the communist countries, visited many of the so-called emerging countries, plus many trips to Europe and to South America; I saw nothing that cheered me as to the prospects for peace. The seeds of war are everywhere; the conflicts of interest are real and deep, and will not be abolished by pious platitudes.

The best we can hope for is a precarious balance of power among the nations capable of waging total war—while endless lesser wars break out here and there.

I won't belabor this. Our campuses are loaded with custard-headed pacifists but the yard of the Naval Academy is one place where I will not encounter them. We are in agreement that the United States still needs a navy, that the Republic will always have need for

heroes—else you would not be here tonight and in uniform.

Patriotism— Moral behavior at the national level. Non sibi sed Patria. Nathan Hale's last words: "I regret that I have but one life to give for my country." Torpedo Squadron Eight making its suicidal attack. Four chaplains standing fast while the water rises around them. Thomas Jefferson saying, "The Tree of Liberty must be refreshed from time to time with the blood of patriots—" A submarine skipper giving the order "Take her *down!*" while he himself is still topside. Jonas Ingram standing on the steps of Bancroft Hall and shouting, "The Navy has no place for good losers! The Navy needs tough sons of bitches who can go out there and *win!*"

Patriotism— An abstract word used to describe a type of behavior as harshly practical as good brakes and good tires. It means that you place the welfare of your nation ahead of your own even if it costs you your life.

Men who go down to the sea in ships have long had another way of expressing the same moral behavior tagged by the abstract expression "patriotism." Spelled out in simple Anglo-Saxon words "Patriotism" reads "Women and children first!"

And that is the moral result of realizing a self-evident biological fact: Men are expendable; women and children are not. A tribe or a nation can lose a high percentage of its men and still pick up the pieces and go on . . . as long as the women and children are saved. But if you fail to save the women and children, you've had it, you're done, you're *through!* You join tyrannosaurus rex, one more breed that bilged its final test.

I must amplify that. I know that women can fight and often have. I have known many a tough old grandmother I would rather have at my side in a tight spot than any number of pseudo-males who disdain military service. My wife put in three years and a butt ac-

tive duty in World War Two, plus ten years reserve, and I am proud—very proud!—of her naval service. I am proud of every one of our women in uniform; they are a shining example to us men.

Nevertheless, as a mathematical proposition in the facts of biology, children, and women of child-bearing age, are the ultimate treasure that we must save. Every human culture is based on "Women and children first"—and any attempt to do it any other way leads quickly to extinction.

Possibly extinction is the way we are headed. Great nations have died in the past; it can happen to us.

Nor am I certain how good our chances are. To me it seems self-evident that any nation that loses its patriotic fervor is on the skids. Without that indispensable survival factor the end is only a matter of time. I don't know how deeply the rot has penetrated—but it seems to me that there has been a change for the worse in the last fifty years. Possibly I am misled by the offensive behavior of a noisy but unimportant minority. But it does seem to me that patriotism has lost its grip on a large percentage of our people.

I hope I am wrong . . . because if my fears are well grounded, I would not bet two cents on this nation's chance of lasting even to the end of this century.

But there is no way to force patriotism on anyone. Passing a law will not create it, nor can we buy it by appropriating so many billions of dollars.

You gentlemen of the Brigade are most fortunate. You are going to a school where this basic moral virtue is daily reinforced by precept and example. It is not enough to know what Charlie Noble does for a living, or what makes the wildcat wild, or which BatDiv failed to splice the main brace and why—nor to learn matrix algebra and navigation and ballistics and aerodynamics and nuclear engineering. These things are merely the working tools of your profession and could be learned elsewhere; they do not require "four

years together by the Bay where Severn joins the tide."

What you do have here is a tradition of service. Your most important classroom is Memorial Hall. Your most important lesson is the way you feel inside when you walk up those steps and see that shot-torn flag framed in the arch of the door: "Don't Give Up the Ship."

If you feel nothing, you don't belong here. But if it gives you goose flesh just to see that old battle flag, then you are going to find that feeling increasing every time you return here over the years . . . until it reaches a crescendo the day you return and read the list of your own honored dead—classmates, shipmates, friends—read them with grief and pride while you try to keep your tears silent.

The time has come for me to stop. I said that "Patriotism" is a way of saying "Women and children first." And that no one can force a man to feel this way. Instead he must embrace it freely. I want to tell about one such man. He wore no uniform and no one knows his name, or where he came from; all we know is what he did.

In my home town sixty years ago when I was a child, my mother and father used to take me and my brothers and sisters out to Swope Park on Sunday afternoons. It was a wonderful place for kids, with picnic grounds and lakes and a zoo. But a railroad line cut straight through it.

One Sunday afternoon a young married couple were crossing these tracks. She apparently did not watch her step, for she managed to catch her foot in the frog of a switch to a siding and could not pull it free. Her husband stopped to help her.

But try as they might they could not get her foot loose. While they were working at it, a tramp showed up, walking the ties. He joined the husband in trying to pull the young woman's foot loose. No luck—

Out of sight around the curve a train whistled. Perhaps there would have been time to run and flag it down, perhaps not. In any case both men went right ahead trying to pull her free . . . and the train hit them.

The wife was killed, the husband was mortally injured and died later, the tramp was killed—and testimony showed that neither man made the slightest effort to save himself.

The husband's behavior was heroic . . . but what we expect of a husband toward his wife: his right, and his proud privilege, to die for his woman. But what of this nameless stranger? Up to the very last second he could have jumped clear. He did not. He was still trying to save this woman he had never seen before in his life, right up to the very instant the train killed him. And that's all we'll ever know about him.

This is how a man dies.

This is how a man . . . lives!

"They shall not grow old
as we that are left grow old,
age shall not wither them
nor the years condemn;
At the going down of the sun
and in the morning,
we shall remember them..."

—Tomb of the
Scottish Unknown Soldier
Edinburgh

**COMING
NEXT
ISSUE:**

**PART II—
THE HAPPY
DAYS AHEAD**

An all-new 30,000 word analysis
of what's right—and wrong—with America
(and what to do about it!)



VITAL SIGNS

BY DEAN ING



'JUSTICE' IS WHAT WE DESERVE.

'MERCY' IS NOT GETTING IT.

Before July, it promised to be an off-year. Not an election year, nor especially a war year—either of which seems to enrich bail-bondsmen. Early in the summer I was ready to remember it as the year I bought the off-road Porsche and they started serving couscous Maroc at Original Joe's. But it was in mid-July when I learned that the Hunter had been misnamed, and that made it everybody's bad year.

It had been one of those muggy days in Oakland with no breeze off the bay to cool a sweaty brow. And I sweat easily since, as a doctor friend keeps telling me, I carry maybe fifty pounds too many. I'm six-two, one-eighty-eight centimeters if you insist, and I tell him I need the extra weight as well as height in my business, but that's bullshit and we both know it. It's

my hobbies, not my business, that make me seem a not-so-jolly fat man. My principal pastimes are good food and blacksmithy, both just about extinct. My business is becoming extinct, too. My name's Harve Rackham, and I'm a bounty hunter.

I had rousted a check-kiting, bail-jumping, small-time scuffler from an Alameda poolroom and delivered him, meek as mice, to the authorities after only a day's legwork. I suppose it was too hot for him to bother running for it. Wouldn't've done him much good anyhow; for a hundred yards, until my breath gives out, I can sprint with the best of 'em.

I took my cut from the bail-bondsman and squeezed into my Porsche. Through the Berkeley tunnel and out into Contra Costa County it was cooler, without the Bay Area haze. Before taking the cutoff toward home I stopped in Antioch. Actually I stopped twice, first to pick up a four-quart butter churn the antique shop had been promising me for weeks, and then for ground horsemeat. Spot keeps fit enough on the cheap farina mix, but he loves his horsemeat. It was the least I could do for the best damn' watchcat in California.

Later, some prettyboy TV newsman tried to get me to say I'd had a premonition by then. No way: I'd read a piece in the *Examiner* about a meteorite off the central coast, but what could that possibly have to do with me? I didn't even have a mobile phone in the Porsche, so I had no idea the Feebies had a job for me until I got home to my playback unit. The FBI purely hates to subcontract a job, anyway. Especially to me. I don't fit their image.

My place is only a short drive from Antioch, a white two-story frame farmhouse built in 1903 in the shadow of Mount Diablo. When I bought it, I couldn't just stop the restoration at the roof; by the time I'd furnished it in genuine 1910 I'd also become a zealot for the blacksmith shop out back. By now I had most

of my money tied up in functional antiques like my Model C folding Brownie camera, my hurricane lamps with polished reading reflectors, swage sets for the smithy, even Cumberland coal for the forge and a cannonball tuyere. I had no one else to spend my money on but before I got Spot, I worried a lot. While I was tracking down bail-jumpers, some thief might've done a black-bag job on the place. With Spot around, the swagman would have to run more than seventy miles an hour.

If I'd had more than five acres, I couldn't've paid for the cyclone fence. And if I'd had less, there wouldn't've been room for Spot to run. The fence doesn't keep Spot in; it keeps sensible folks out. Anybody who ignores the CHEETAH ON PATROL signs will have a hard time ignoring Spot, who won't take any food or any shit from any stranger. I'm a one-cat man, and Spot is a one-man cat.

I saw him caper along the fence as he heard the gutteral whoosh of the Porsche fans. I levered the car into boost mode, which brings its skirts down for vastly greater air-cushion effect. Just for the hell of it, I jumped the fence.

An off-road Porsche is built to take a Baja run, with reversible pitch auxiliary fans that can suck the car down for high cornering force on its wheels, or support it on an air cushion for brief spurts. But I'd seen Feero on film, tricking his own Baja Porsche into bouncing on its air cushion so it'd clear an eight-foot obstacle. You can't know how much fun it was for me to learn that unless you weigh as much as I do.

Of course, Spot smelled the horsemeat and I had to toss him a sample before he'd quite pestering me. After we sniffed each other around the ears—don't ask me why, but Spot regards that as a kind of backslap—I went to the basement and checked Spot's automated feeder. My office is in the basement, too, along with all my other contemporary stuff. From

ground level up, it's *fin-de-siècle* time at my place, but the basement is all business.

My phone playback had only two messages. The first didn't matter, because the last was from Dana Martin in Stockton. "We have an eighty-eight fugitive and we need a beard," her voice stroked me; softly annealed on the surface, straw-tempered iron beneath. "My SAC insists you're our man. What can I say?" She could've said, whatever her Special Agent in Charge thought in Sacramento, she hated the sight of me. She didn't need to: ours was an old estrangement. "I can come to your place if you'll chain that saber-toothed animal. And if you don't call back by five PM Friday, forget it. I wish they'd pay me like they'll pay you, Rackham." Click.

My minicomputer terminal told me it was four-forty-six. I dialed a Stockton number, wondering why the FBI needed a disguising ploy to hunt a fugitive fleeing from prosecution. It could mean he'd be one of the shoot-first types who can spot a Feebie around a corner. I can get close to those types but I'm too easy a target. The hell of it was, I needed the money. Nobody pays like the Feebies for the kind of work I do.

Miz Martin was out mailing blueprints but was expected shortly. I left word that I'd rassle the saber-tooth is she wanted a souffle at my place, and hung up chuckling at the young architect's confusion over my message. Time was, brick agents didn't have to hold down cover jobs. Dana did architectural drafting when she wasn't on assignment for her area SAC, who's in Sacramento.

I took a fresh block of ice from the basement freezer and put it in my honest-to-God icebox upstairs. I had nearly a dozen fertile eggs and plenty of cream, and worked up a sweat all over again playing with my new butter churn until I'd collected a quarter-pound of the frothy cream-yellow stuff. It smelled too good to use for cooking, which meant it was just right.

After firing up the wood stove, I went outside for coolth and companionship.

I'd nearly decided La Martin wouldn't show and was playing 'fetch' with my best friend when, far down the graveltop road, I heard a government car. When you hear the hum of electrics under the thump of a diesel, it's either a conservation nut or a government man. Or woman, which Dana Martin most assuredly is.

Spot sulked but obeyed, stalking pipe-legged into the smithy as I remoted the automatic gate. Dana decanted herself from the sedan with the elegance of a debutante, careless in her self-assurance, and stared at my belt buckle. "It's a wonder your heart can take it," she sniffed. Dana could well afford to twit me for my shape. She's a petite blonde with the face of a littlest angel and a mind like a meat cleaver. One of those exquisite-bodied little charmers you want to protect when it's the other guy who needs protection.

I knew she worked hard to keep in shape and had a fastidious turn of mind so, "We can't all have your tapeworm," I said.

I thought she was going to climb back into the car, but she only hauled a briefcase from it. "Spare me your ripostes," she said; "people are dying while you wax clever. You have an hour to decide about this job."

Another slur, I thought; when had I ever turned down Feebie money? I let 'no comment' be mine, waved her to my kitchen, poked at the fire in the stove. Adjusting the damper is an art, and art tends to draw off irritation like a poultice. I started separating the eggs, giving Dana the cheese to grate.

She could've shredded Parmesan on her attitude. "I can brief you," she began, "only after you establish an oral commitment. My personal advice is, don't. It needs an agile man."

"Hand me the butter," I said.

She did, shrugging. "All I can tell you beforehand, is that the fugitive isn't human."

"Spoken like a true believer, Dana. As soon as somebody breaks enough laws, you redefine him as an unperson."

Relishing it: "I'm being literal, Rackham. He's a big, nocturnal animal that's killed several people. The Bureau can't capture him for political reasons; you'll be working alone for the most part; and it is absolutely necessary to take him alive."

"Pass the flour. But he won't be anxious to take *me* alive; is that it?"

"In a nutshell. And he is much more important than you are. If you screw it up, you may rate a nasty adjective or two in history books—and I've said too much already," she muttered.

I stirred my supper and my thoughts, adding cayenne to both. Obviously in Bureau files, my dealings with animals hadn't gone unnoticed. They knew I'd turned a dozen gopher snakes loose to eliminate the varmints under my lawn. They knew about my ferret that kept rats away. They knew Spot. I'd taken a Kodiak once, and they knew that, too. But true enough, I was slower now. I postulated a Cape Buffalo, escaped while some South Africans were presenting it to a zoo, worth its weight in krugerrands to antsy politicians. "I think I'll give this one a 'bye,'" I sighed and, as afterthought: "but what was the fee for taking it *a la* Frank Buck?"

"Who the devil is Frank Buck?"

"Never mind. How much?"

"A hundred thousand," she said, unwilling.

I nearly dropped the dry mustard. For that, I could find Spot a consort and dine on escargot every night. "I'm in," I said quickly. "Nobody lives forever."

While the souffle baked, Dana revealed how far

afield my guess had gone. I fed her flimsy disc into my office computer downstairs and let her do the rest. The display showed a map of Central California, with a line arching in from offshore. She pointed to the line with a light pencil. "That's the path of the so-called meteorite last Saturday night. Point Reyes radar gave us this data." Now the display magicked out a ream of figures. "Initial velocity was over fifteen thousand meters per second at roughly a hundred klicks altitude, too straight and too fast for a ballistic trajectory."

"Would you mind putting that into good old feet and miles? I'm from the old school, in case you hadn't noticed," I grinned.

"You're a goddam dinosaur," she agreed. "Okay: we picked up an apparent meteorite coming in at roughly a forty-five degree angle, apparent mass um, fifty tons or so, hitting the atmosphere at a speed of about—fifty thousand feet per second. Accounting for drag, it should've still impacted offshore within a few seconds, sending out a seismometer blip, not to mention a local tsunami. It didn't."

"It decelerated at a steady hundred and forty g's and described a neat arc that must've brought it horizontal near sea-level."

I whistled. "Hundred and forty's way above human tolerance."

"The operative word is 'steady'. It came in so hot it made the air glow, and it was smart—I mean, it didn't behave as though purely subject to outside forces. That kind of momentum change took a lot of energy under precise control, they tell me. Well, about eleven seconds after deceleration began it had disappeared, too low on the horizon for coverage, and loafing along at sub-mach speed just off the water."

"Russians," I guessed.

"They know about it, but it wasn't them. Don't they wish? It wasn't anybody human. The vehicle came in

over the Sonoma coast and hedge-hopped as far as Lake Berryessa northwest of Sacramento. That's where the UFO hotline folks got their last report and wouldn't you know it, witnesses claimed the usual round shape and funny lights."

I sprinted for the stairs, Spot-footed across the kitchen floor, snuck a look into the oven. "Just in time," I called, as Dana emerged from below.

She glanced at the golden trifle I held in my potholder, then inhaled, smiling in spite of herself. "You may have your uses at that."

"Getting up here so fast without jolting the souffle?"

"No, cooking anything that smells this good," she said, and preceded me to the dining room. "I don't think you have the chance of a cardiac case on this hunt, and I said as much to Scott King."

She told me why over dinner. The scrambled interceptors from Travis and Beale found nothing, but a Moffett patrol craft full of sensor equipment sniffed over the area and found traces of titanium dioxide in the atmosphere. Silicon and nox, too, but those could be explained away.

You couldn't explain away the creature trapped by college students near the lake on Sunday evening. Dana passed me a photo, and my first shock was one of recognition. The short spotted fur and erect short ears of the quadruped, the heavy shoulders and bone-crunching muzzle, all reminded me of a dappled bear cub. It could have been a terrestrial animal wearing a woven metallic harness but for its eyes, small and lowset near the muzzle. It looked dead, and it was.

"The pictures were taken after it escaped from a cage on the Cal campus at Davis and electrocuted itself, biting through an autoclave power line. It was evidently a pet," Dana said, indicating studs on the harness, "since it couldn't reach behind to unlock this

webbing, and it wasn't very bright. But it didn't need to be, Harve. It was the size of a Saint Bernard. Guess its weight."

I studied the burly, brawny lines of the thing. "Two hundred."

"Three. That's in kilos," Dana said. "Nearly seven hundred pounds. If it hadn't got mired in mud near a student beer-bust, I don't know how they'd have taken it. It went through lassos as if they were cheese, using this."

Another photo. Above each forepaw, which seemed to have thumbs on each side, was an ivorylike blade, something like a dewclaw. One was much larger than the other, like the asymmetry of a fiddler crab. It didn't seem capable of nipping; slashing, maybe. I rolled down my sleeves; it wouldn't help if Dana Martin saw the hairs standing on my forearms. "So how'd they get it to the Ag people at Cal-Davis?"

"Some bright lad made a lasso from a tow cable. While the animal was snarling and screeching and biting the cable, they towed it out of the mud with a camper. It promptly chased one nincompoop into the camper and the guy got out through the sliding glass plate upfront—but he lost both legs above the ankle; it seems the creature ate them.

"The Yolo County Sheriff actually drove the camper to Davis with that thing fighting its way through the cab in the middle of the night." Dana smiled wistfully. "Wish I could've seen him drive into that empty water purification tank, it was a good move. The animal couldn't climb out, the Sheriff pulled the ladder up, and a few hours later we were brought into it and clamped the lid down tight."

"Extraterrestrial contact," I breathed, testing the sound of a phrase that had always sounded absurd to me. The remains of my souffle were lost in the metallic taste of my excitement—okay, maybe 'excitement' wasn't quite the right word. "If that's the kind of pets





they keep, what must *they* be like?"

"Think of Shere Khan out there," Dana jerked a thumb toward a window, "and ask what you're like."

Why waste time explaining the difference between a pet and a friend? "Maybe they're a race of bounty hunters," I cracked lamely.

"The best guess is that the animal's owner is hunting, all right. Here's what we have on the big one," she said, selecting another glossy. "Four men and a woman weren't as lucky as the fellow who lost his feet."

I gazed at an eight-by-ten of a plaster cast, dirt-flecked, that stood next to a meter stick on a table. Something really big, with a paw like a beclawed rhino, had left pugmarks a foot deep. It might have been a species similar to the dead pet, I thought, and said so. "Where'd this cast come from?"

"Near the place where the beer-bust was busted. They're taking more casts now at the Sacramento State University campus. If the hunter's on all-fours, it may weigh only a few tons."

"Davis campus; Sac State—fill it in, will you?"

It made a kind of sense. Once inside a chilled-steel cage, the captive pet had quieted down for ethologists at Davis. They used tongs to fumble a little plastic puck from a clip on the harness, and sent it to Sacramento State for analysis, thinking it might be some kind of an owner tag. It turned out to be a bug, an AM/FM signal generator—and they hadn't kept it shielded. The owner must have monitored the transmitter and followed it to Sacramento. More guesswork: its vehicle had traveled in the American River to a point near the Sac State labs where the plastic puck was kept.

And late Tuesday evening, something big as a two-car garage had left a depression on the sand of an island in the river, and something mad as hell itself had come up over the levee and along a concrete path

to the lab.

A professor, a research assistant, a top-clearance physicist brought in from nearby Aerojet, and an FBI field agent had seen the hunter come through a pumice block wall into the lab with them, but most of the information they had was secure.

Permanently.

Dana Martin didn't offer photos to prove they'd been dismembered, but I took her word for it. "So your hunter got its signal generator back," I prompted, "and split."

"No, no, and yes. It's *your* hunter, and our man had left the transmitter wrapped in foil in the next room, where we found it. But yes, the hunter's gone again."

"To Davis?"

"We doubt it. Up the river a few klicks, there's an area where a huge gold dredge used to spit its tailings out. A fly-fisher led us to remains in the trailings near the riverbank yesterday. A mighty nimrod type who'd told his wife he was going to sight in his nice new rifle at the river. That's a misdemeanor, but he got capital punishment. His rifle had been fired before something bent its barrel into a vee and—get this—embedded the muzzle in the man's side like you'd bait a hook."

"That's hard to believe. Whatever could do that, could handle a gorilla like an organ grinder's monkey."

"Dead right, Rackham—and it's loose in the dredge tailings."

Well, she'd warned me. I knew the tailings area from my own fishing trips. They stretch for miles on both sides of the American River, vast high cairns of smooth stones coughed up by a barge that had once worked in from the river. The barge had chewed a path ahead of it, making its own lake, digesting only the gold as it wandered back and forth near the river. Seen from the air, the tailings made snaky patterns

curling back to the river again.

This savage rape of good soil had been committed long ago and to date the area was useless. It was like a maze of gravel piles, most of the gravel starting at grapefruit size and progressing to some like oval steamer trunks. A few trees had found purchase there; weeds; a whole specialized ecology of small animals in the steep slopes. The more I thought about it, the more it seemed like perfect turf for some monstrous predator.

I took a long breath, crossed my arms, rubbed them briskly and stared across the table at Dana Martin. "You haven't given me much to go on," I accused.

"There's more on the recording," she said softly.

I guessed from her tone: "All bad."

Shrug: "Some bad. Some useful."

I let her lead me downstairs. She had an audiotape salvaged from the lab wreckage, and played me the last few minutes of it.

A reedy male expounded on the alien signal generator. "We might take it apart undamaged," he ended, sounding wistful and worried.

"The Bureau can't let you chance it," said another male, equally worried.

A third man, evidently the Aerojet physicist, doubted the wisdom of reproducing the ar-eff signals since what looked like junk on a scope might be salient data on an alien receiver. He offered the use of Aerojet's X-ray inspection equipment. A young woman—the research assistant—thought that was a good idea at first. "But I don't know," she said, and you could almost hear her smile: "it looks kinda neat the way it is."

The woman's sudden voice shift stressed her non sequitur. It sounded idiotic. I tossed a questing frown at Dana and positively gaped as the recording continued.

The Feebie again: "I suppose I could ask Scott King

to let you disassemble it. Hell, it's harmless," he drawled easily in a sudden about-face. King, as I knew, was his—and Dana Martin's—SAC in the region.

The reedy older voice was chuckling now. "That's more like it; aren't we worrying over trifles?"

The physicist laughed outright. "My sentiments exactly." Under his on-mike mirth I could hear the others joining in.

And then the speaker overloaded its bass response in a thunderous crash. Several voices shouted as the second slam was followed by clatters of glass and stone. Clear, then: "Scotty, whatthehell—", ending in a scream; three screams. From somewhere came a furious clicking, then an almost subsonic growling *whufffff*. Abrupt silence. Posterity had been spared the rest.

I glowered at Dana Martin. "What's good about that?"

"Forewarning. Our man wasn't the sort to vacillate, and the professor was known as a sourball. It's barely possible that they all were being gassed somehow, to hallucinate during the attack."

"Maybe," I said. "That would explain why your man thought he saw Scotty King coming through the wall. Ah,—look, Dana, this just about tears it. You need a covey of hoverchoppers to find this, this hunter of yours. I get a picture of something that could simply stroll up to me while I grinned at it, and nothing short of a submarine net could stop it. Won't I even have a brick agent to help?"

"Every hovercraft we can spare is quartering the Berryessa region. And so are a lot of chartered craft," she said softly, "carrying consular people from Britain, France, the Soviets, and the United Chinese Republics. *They know*, Rackham, and they intend to be on hand from the first moment of friendly contact."

"Some friendly contact," I snorted. I realized now

that the air activity over Lake Berryessa was a deliberate decoy. "Surely we have the power to ground the rest of these guys . . ."

"The instant our government makes contact, we are committed by treaty to sharing that confrontation with the rest of the nuclear club," Dana said wearily. "It's an agreement the Soviets thought up last year, of which we have been forcibly reminded in the past days."

I showed her my palms.

"You're not government," she hissed. "We're a laissez faire democracy; we can't help it if a private U.S. citizen does the first honors. Could we help it if he should dynamite the spacecraft in perfectly understandable panic?"

"Destroy a diamond-mine of information? Are you nuts?" For the first time my voice was getting out of hand.

"Perfectly sane. We've got a kit for you to record the experience if you can get into the craft—maybe remove anything that looks portable, and hide it. We don't want you to totally wreck the vehicle, just make it a hangar queen until another civilian friend has studied the power plants and weaponry, and then he might blow it to confetti."

I was beginning to see the plan. Even if it worked it was lousy politics. I told her that.

"This country," she said, "has an edge in communications and power plants at the moment. We'd a whole lot rather keep that edge, and learn a few things to fatten it, than take a chance that everybody—including Libya—might get onto an equal technological footing with us overnight. Now will you drop the matter?"

"I may as well. Am I supposed to ask the damn' hunter for some thermite so I can burn his ailerons a little?"

"We've sunk a cache of sixty per cent dynamite in

the river shallows for you—common stuff you could buy commercially. We've marked it here on a USGS map. Best of all, you'll have a weapon."

I brightened, but only for a moment. It was a gimmicked Smith & Wesson automatic, a bit like a Belgian Browning. Dana took it from her briefcase with reverence and explained why the special magazine carried only seven fat rounds. I could almost get my pinkie in the muzzle: sixty calibre at least. It was strictly a short-range item rigged with soluble slugs. Working with the dead pet and guessing a lot, Cal's veterinary science wizards had rendered some of its tissues for tallow and molded slugs full of drugs. They might stop the hunter.

On the other hand, they might not.

If I couldn't make friends with it I would be permitted to shoot for what, in my wisdom, I might consider noncritical spots on its body.

Finally, if I hadn't been marmaladed and if I had it stunned, I was to punch a guarded stud on the surveillance kit which looked like an amateur's microvid unit with a digital watch embedded in its side. At that point I could expect some other co-opted civilian to 'happen' onto me with his Hoverover.

I wondered out loud how much money the other guy was getting for his part in this, and Dana reminded me that it was none of my damned business. Nor should I worry too much about what would happen after the beast was trussed up in a steel net and taken away. It would be cared for, and in a few days the Feebies would 'discover' what the meddling civilians had done, and the rest of the world could pay it homage and raise all the hell they liked about prior agreements which, so far as anyone might prove, would not have been violated. It was sharp practice. It stank. It paid one hundred thousand dollars.

I collected the pitifully small assortment of data and equipment, making it a small pile. "And with

this, you expect me to set out?"

"I really expect you to *crap* out," she said sweetly, "in which case you can expect to be iced down for awhile. We can do it, you know."

I knew. I also knew she had the extra pleasure of having told me not to commit myself. There was one more item. "What if I find more than one hunter?"

"We only need to bag one. For reasons I'm not too clear on, we don't think there's more. Something about desperation tactics, I gather." She frowned across the stuff at me. "What's so funny—or are you just trembling?"

I shook my head, waved her toward the stairs. "Go home, Dana. I was just thinking: it's our tactics that smack of desperation."

She swayed up the stairs, carrying her empty case, talking as she went. It was no consolation to hear that nobody would be watching me. The little foil-wrapped AM/FM bug would be my only bait, and of course they'd be monitoring that; but it was essential that I dangle the bait only in some remote location. Lovely.

Spot ambled out as he heard my automatic gate energize, chose to frisk alongside Dana Martin's sedan as she drove away. I called him back, closed the gate, and felt Spot's raspy tongue on the back of my hand. I shouted at him and he paced away with injured dignity, his ears back at half-mast. How could I explain it to him? I knew he was enjoying the salt taste of sweat that ran down my arm in defiance of the breeze off Mount Diablo. It might have been worse: some guys get migraines. I'd known one—a good one, too, in my business—who'd developed spastic colon. All I do is sweat, without apologizing. You can't explain fear to a cheetah . . .

I spent the next hour selecting my own kit. In any dangerous business, a man's brains and his equip-

ment are of roughly equal quality. Nobody has yet worked out a handier field ration than 'gorp', the dry mix of nuts, fruit bits and carob I kept—but I tossed in a few slabs of pemmican, too. Water, spare socks, a McPhee paperback, and my usual stock of pills, including the lecithin and choline.

I considered my own handguns for a long time, hefting the Colt Python in a personal debate, then locked the cabinet again and came away empty-handed. In extremis, my own Colt would've been too great a temptation—and I already had a weapon. Whether it would work was something else again.

When the Porsche was loaded I spent another hour in my office. The maps refreshed my memory, corrected it in a few cases. A new bridge over the American River connected Sacramento's northeast suburb of Orangevale with Highway Fifty, cutting through the dredge tailings. Gooseflesh returned as I imagined the scene at that moment. Dark as a hunter's thoughts, not enough moon to help, the innocent romantic gleam of riffles on water between the tailings to the south and the low cliffs on the north side. More tailings on the other side too, upriver near Orangevale. This night—and maybe others—it would be approximately as quiet, as inviting, as a cobra pit. I pitied anyone in that area, but not enough to strike out for it in the dark. I needed a full day of reconnaissance before setting out my bait, and a good night's sleep wouldn't hurt.

Usually, sleep is no problem. That night it was a special knack. And while I slept, a pair of youthful lovers lay on a blanket near the river, too near the Sac State campus, and very nearly died.

Saturday morning traffic was light on the cutoff to Interstate Five. I refueled just south of Sacramento, then drove across to the El Dorado Freeway and fought the temptation to follow it all the way to Lake

Tahoe. A part of my mind kept telling me I should've brought Spot along for his nose and ears, but I liked him too much to risk him.

I left the freeway east of the city and cruised slowly toward the river, renewing auld acquaintance as I spotted the river parkway. Nice: hiking and bridle trails paralleled the drive, flowing in and out of trees that flanked the river. I didn't wonder why the area was deserted until I saw the road crew lounging near their barricade. The flagman detoured me to a road that led me to a shopping center. I checked a map, took an arterial across the river, spotted more barricades and flagmen barring access to the drive along the north bank of the river as well.

That flagman's khakis had been creased; and who irons work khakis these days? Also, he'd been too pale for a guy who did that every day. I found a grocery store and called Stockton from there, cursing.

Dana Martin answered on the first ring, bright and bubbly as nearbeer and twice as full of false promise. "Hi, you ol' dumplin'," she cascaded past, after my first three words. I stammered and fell silent. "I won't be able to make it today, but you have Wanda's address; she's really dynamite. Why don't you call on her, shug, say around noonish, give or take an hour? Would you mind just terribly?"

I'd worked with Dana enough to know that the vaguer she sounded, the exacter she meant. Wanda at twelve on the dot, then—except that I didn't know the lady or her address. "Uh, yeah, sure; noonish more or less. But I've mislaid her address. You got her phone number?"

Slow, saccharine: "She hasn't got a phone, hon-eybuns. Must you have a map for such a dynamite lady?"

Map. Dynamite. Ahhh, shee-it, but I was dull. "Right; I must have it somewhere. The things I do for love," I sighed.

Dana cooed that she had just oodles of work to do, and hung up before I could object that the whole goddam river area was crawling with fuzz in false clothing.

I went back to the Porsche and studied my map. The explosive cache was fairly near a dead-end road, only a few miles downriver. I found the road led me past a few expensive homes to a turnaround in sight of the river. No barricades or khaki-clads that I could see, but the damned dredge had committed some of its ancient crimes nearby. I guessed there were so many dead-end roads near the river it would take an army to patrol them all. It was nearly two hours before noon and it occurred to me that the time might best be spent checking available routes to and from the tailings areas.

Shortly before noon I hauled ass from a bumpy road near Folsom and headed for my tryst with Wanda. I'd marked several routes on the map, where I could get very near tailings or sandbars from Sacto to Folsom. It was the sort of data the Feebies couldn't have given me, since they didn't really know what the Porsche could do.

At eleven fifty-three I realized I was going to be late if I kept to the boulevards. I checked my route, turned right, zipped on squalling tires to a dead end, and shifted to air cushion mode. A moment later the Porsche was whooshing over the lawn of some wealthy citizen, scattering dandelion puffs but leaving no tracks as it took me downslope and over a low decorative fence.

Using the air cushion there's always the danger of overspeeding the Porsche's primary turbo, but I kept well below redline as I turned downriver just above the ripples. In air cushion mode, the legendary quick response of a Porsche is merely a myth. The car comes about like a big windjammer and tends to wander with sidewinds, so I had my hands full. But I navi-

gated five miles of river in four minutes flat.

Triangulating between bridges, eyeballing the map, I estimated that the cache of dynamite was at the foot of a bush-capped stone outcrop that loomed over the river. I slowed, eased onto a sandbar, let the car settle and left the turbo idling. At exactly noon by my watch, I stood over a swirl of bubbly river slime as long and broad as my kitchen. It had sticks and crud in it, and reminded me of the biggest pizza in town, which made my belly rumble. Junk food has its points too.

I was thirty feet from the Porsche, and past my grumbling gut and the turbo whistle I could hear the burbling hiss of the river. Nothing else. It was high noon on a sandbar on a hot Saturday in the edge of Sacrabloodymento, perfect for a meal and a snooze, and there I stood feeling properly unnerved, waiting for a woman to tell, or bring, or ask me something. I put one hand to my jacket, feeling the automatic in my waistband for cold-steel comfort, and to nobody at all I shook my head in disgust and said, "Wanda."

"Mister Rackham," said the voice above me, and I damned near jumped into the river. He was decked out in waders and an old fishing vest of exactly the right shades to blend with the terrain. He had a short spinning rig, and behind the nonglint sunglasses he was grinning. He'd sat inside those bushes atop that jumble of rocks and watched me from above the whole time, getting his jollies. I'd busted my hump to be punctual but judging from this guy's demeanor, fifteen minutes one way or the other wouldn't've mattered. No wonder people learn to scoff at government orders!

He'd done nothing for my mood, or my confidence. I cleared my throat. "Would you mind telling me—" I trailed off.

"I'm Agent Wanda. And there can't be two car-and-mercenary combos like you, *anywhere*." He

didn't climb down but made a longish cast into the river; began to reel in. "New developments," he said casually. "Fortunately all the white noise around us should raise hob with any shotgun mikes across the water."

I waited until he'd reeled in, changed his spinner for another lure, and flashed me the I.D. in his lure wallet as though by accident. Wanda explained that while the decoy action at Lake Berryessa still seemed to be working on the foreign nationals, some of that cover might be wearing thin. The night before, a lovestruck couple had been thoroughly engaged—even connected, one might infer—near the river when something, surely not boredom, added a religious touch to their experience. According to the girl it seemed to be a great guardian angel, suddenly transformed into a moving rock of ages wielding a terrible swift sword.

Agent Wanda broke off to tell me the girl was a devout fundamentalist, evidently a newcomer to the oldest sport, who'd been overcome by her sense of the rightness and safety of it all—until a huge boulder nearby became a winged angel, gave a mighty chuff, flashed a scimitar in the faint moonlight, and glided into the river like a stone again to sink from sight. It left pugmarks. It probably weighed five tons.

To the girl it had been a powerful visitation. To her boyfriend, who also got a set of confused images of the thing, it had been a derailment. But the girl was the niece of the Sacramento County Sheriff who had—and here fisherman Wanda drawled acid—not been told of the security blanket. The girl trusted her uncle, called him in hysterics. He knew an explosion had taken its toll at a campus lab, and had heard from Yolo County where his counterpart had delivered a wild woolly package to another campus, and like any good lawman he put some things together. By now, elements of the city, county, state and United States

were gradually withdrawing the cordon of bozos he had deputized and strung along the river. It was quick action, but far too obvious to suit the feds. Worse still, the campus radio station at Sac State had already got an exclusive from the young man.

School media, Wanda told me, have their own news stringers and an alternative network in National Public Radio. When KERS-FM ran its little hair-raiser on Saturday morning, it scooped the whole country including the FBI. The Feebies had only managed by minutes to quash a follow-up story which, in its usual ballsy aggressive way, NPR's network headquarters in Washington had accepted from Sacramento. It described a huge version of the dead specimen, complete with silvery harness and flaming sword. As a dog-days item for summer consumption, it had almost been aired coast-to-coast over NPR. It would have blown the government's cover from hell to lunch. As it was, KERS had already aired too much of the truth in Sacramento but with TV, Wanda sighed, fortunately almost nobody listens to NPR.

I resolved, in the future, to pay more attention to National Public Radio; it was my kind of network. Meanwhile, the national government was drawing off the protective net along the river, to avoid tipping our hand to other governments—while casually allowing hundreds of nature lovers to wander into harm's way. When officialdom up and down the line conspires to endanger a thousand people, I reasoned, it must be balancing them against a whole lot more. Millions, maybe. It was a minimax ploy: risk a little, save a lot. I began to feel small, like the lure on the end of Wanda's monofilament line: hurled into deep water and very, very expendable.

I watched Wanda cast again, the line taking a detour into the deepest part of the channel. "I expect my explosives are under all that crap," I said, jerking a palm toward the slowly wheeling green pizza in the

lee of the stone outcrop.

"Sure is. Looks natural, doesn't it? Just grab the edge and pull it in when you need it. It's anchored on a swivel to a weighted canvas bag. And you know what's in the bag."

I stared at the spinning pizza, and damned if it wasn't a work of plastic camouflage. Real debris, polyurethane slime and bubbles, gyrating in an eddy. I said, "Never know what's real along the river, I guess."

"That's the point," Wanda replied, pulling against a snag almost below him. "The hunter was in plain sight last night, not ten meters from those kids, and the girl claims she never felt so safe. Even thought she saw an approving angel for a few seconds."

"Like your man thought he saw his SAC coming through that wall on the campus?"

"Could be," he nodded. "We thought you should know that, and the part about your quarry being at home in the water."

He frowned at the river; his rod bent double until he gave it slack. I touched my sidearm for luck as his line moved sideways, then began a stately upstream progression. "Jesus, I must have a salmon," he said, his face betraying a genuine angler's excitement.

With the bright July sun and the clear sierra water, I saw a dark sinuous shape far below the surface and grinned. I knew what it was; it wasn't salmon time, and salmon don't move with the inexorable pace of a finned log moving upstream. "No, you have a problem," I said. "And so do I, if a gaggle of Soviet tourists come snooping around here in copters."

"Just keep it in mind," said Wanda, scrambling up, reluctantly letting more line out. "Play it safe and don't have a higher profile than necessary." Then, plaintively, as I turned to go: "What the hell do I have here?"

"Sturgeon."

Pause as the upstream movement paused. Then, "How do I land it?"

I nodded toward the plastic pizza. "Try some sixty per cent dynamite. Or wait him out. Some of 'em get to be over ten feet long; don't worry, they're domestic."

He called to me as I trudged to my Porsche: "Domestic, *schmomestic*; what's that got to do with it?"

I called back: "I mean it's not a Soviet sturgeon. At least you needn't worry about catching an alien."

When I drove away he was still crouched there, a perfect metaphor of the decent little guy in a big government, jerking on his rod and muttering helplessly. I kept the Porsche inches off the water en route downriver as far as the county park and thrilled a bunch of sporty car freaks as I hovered to the perimeter road, trying to let the good feeling last. It wouldn't; all the Feebie had to do was cut his line and he'd be free of his problem. All I had to do was unwrap an alien transmitter and my problem would come to me in a hurry. Maybe.

For sure, I wasn't about to do it in full view of a dozen picnickers. I hadn't yet seen a piece of ground that looked right for me, and I'd covered a lot of river. To regain the low profile I drove twenty miles back upriver on the freeway without being tailed, and to exercise my sense of the symbolic I demolished a pizza in Folsom. Thus fortified, I found a secondhand store in the restored Gay Nineties section of Folsom and bought somebody's maltreated casting rig with an automatic rewind. Wanda had been right to use fishing as a cover activity. I was beginning to grow paranoid at the idea of foreign nationals watching me—and drawing sensible conclusions.

I drove from Folsom to a bluff that overlooked the river and let my paranoia have its head as I studied

the scene. Somewhere, evidently downriver, lay my quarry. I'd assumed it was nocturnal simply because it hadn't shown in daylight. But for an instant, just before I caught a glimpse of that sturgeon, I'd realized the hunting beast might have been on the other end of Wanda's line. Truly nocturnal? Not proven . . .

I'd also assumed, without thinking it out, that the hunter was strictly a land animal. Scratch another assumption; it apparently could stroll underwater like a hippo. Gills? Scuba?

The report about the sword led me to a still more worrisome train of thought. A saber was hardly the weapon I'd expect from an intelligent alien. What other, more potent, weapons did it carry? Its harness might hold anything from laser weapons to poison gas—unless, like the smaller animal, it too was a pet. Yet there had been no evidence of modern weapons against humans. The fact was, I hadn't the foggiest idea what range of weapons I might run up against.

Finally there was the encounter with the lovers, sacrificial lambs who weren't slaughtered after all. Why? They could hardly have been more vulnerable. Maybe because they were mating; maybe, for that matter, because they *were* vulnerable. All I could conclude was that the hunter did discriminate.

One thing sure: he knew how to keep a low profile with his own vehicle. So where do you hide a fifty-ton spacecraft? Surely not where it can be spotted from the air. The likeliest place seemed to be in the river itself, but I could think of a dozen reasons why that might not be smart. And if the Feebies couldn't track it by satellite from Berryessa to Sacramento, the hunter was either damned smart, or goddam lucky.

I decided to make some luck on my own by being halfway smart, and eased the Porsche down to the river. It takes less fuel to hover on the water if you're not in a big hurry, and I cruised downstream slowly

enough to wave at anglers. Mainly, I was looking for a likely place to spend the night.

A glint from the bluffs told me someone was up there among the trees in heavy cover. Birdwatcher, maybe. From the British Embassy, maybe. I swept across to a banana-shaped island in plain sight and parked, then unlimbered my spinning rig and tried a few casts. I never glanced toward the bluffs and I still don't know if it was perfidious Albion or paranoia that motivated me. But while sitting on a grassy hummock I realized that I couldn't choose a better stakeout than one of these islands.

It required a special effort for me to scrunch through the sand at the water's edge. If I'd weighed five tons it should slow me a lot more. Even a torpedo doesn't move through water very fast; if I chose an island with extensive shallows and a commanding view, I'd have plenty of warning. Well, that was the theory . . .

By the time I'd found my island, the sun was nearing trees that softened the line of bluffs to the west, and dark shadows crept along the river to make navigation chancy. It's no joke if the Porsche's front skirts nose into white water, especially if the turbo intake swallows much of it. I floated upslope past clumps of brush and cut power as my Porsche nosed into tall weeds at the low crest. I stretched my legs, taking the fishing equipment along for protective coloration, and confirmed my earlier decision. It was the best site available.

The island was maybe two hundred yards long; half that in width. Tailings stretched away along both sides of the river. Sand and gravel flanked the island on all sides and the Porsche squatted some twenty feet above the waterline. The nearest shallows were thirty yards from me and, accounting for the lousy traction, I figured Spot might cover the dis-

tance in four or five seconds. Surely, surely the hunter would be slower: In that time I could jump the Porsche to safety and put several rounds into a pursuer.

Then I bounced my hand off my forehead and made a quick calculation. If I hoped to be ready for damn-all at any second, I absolutely *must not* let the turbo cool down. It takes roughly twelve seconds before the Porsche can go from dead cold to operational temperature, but if I kept it idling I'd be okay. Fuel consumption at idle: ten quarts an hour. I sighed and trudged back to the car, and went back to Folsom and refueled. Oh, all right: and had Oysters Hangtown with too much garlic and synthetic bacon. Hell; a guy's gotta eat.

I cruised back to the island again by way of the tailings. I'd been half afraid the air cushion wouldn't work along those steep piles of river-rounded stone. Now I was all the way afraid, because it only half worked. You can't depend on ground effect pressure when the 'ground' is full of holes and long slopes. It was like roller-coasting over an open cell sponge; controlling it was a now-you-have-it, now-you-don't feeling. As sport it could be great fun. As serious pursuit it could be suicide.

Back among the tall weeds atop the island, I let the Porsche idle as I walked the perimeter again, casting with my pitiful used rig now and then for the sake of form. How any trout could be so naive as to hit my rusty spinner I will never know; I played the poor bastard until he finally threw the hook. Ordinarily I would've taken him home for an Almondine. But they spoil fast, and I wasn't planning on any fires, and if Providence was watching maybe It would give me a good-guy point. God knows I hadn't amassed many.

There were no pugmarks or prints in the sand but mine, and the tic tac toeprints of waterbirds. I returned to the Porsche and unwrapped the foil shield-

ing from the rounded gray disc that had already cost too many lives. It was smaller than a hockey puck, featureless but for a mounting nipple. It didn't rattle, hum, or shine in the lengthening shadows, but it had been manufactured by some nonhuman intelligence, and it damned well gave me indigestion. I knew it was broadcasting as it lay in my hand even if I couldn't detect it: calling like unto like, alien to alien, a message of—what? Distress? Vengeance? Or simply a call to the hunt? I imagined the hunter, responding to the call by cruising upriver in its own intersteller Porsche, as it were, and got busy with an idea that seemed primitive even to me, while the light was still good enough to work by.

I cut a pocket from my jacket, a little bag of aramon fiber that held the alien transmitter easily. Then, using a fishhook as a needle, I sewed the bag shut and tied it, judging the monofilament line to be twenty pound test. Finally I jammed the rod into the crotch of a low shrub, took the bag, and walked down the gentle slope kicking potential snags out of the way. I laid the bag in the open, hidden by weeds fifteen yards from the water's edge, and eyeballed my field of fire from the Porsche that whined softly to me from above. It was ready to jump. So was I.

A light overcast began to shoulder the sun over the horizon, softening the shadows, making the transition to darkness imperceptible. I retreated to the car, grumbling. I knew there were special gadgets that Dana Martin's puppeteers could have offered me. Night-vision glasses, mass-detector bugs to spread around, constant two-way tightband TV between yours truly and the feds—the list became a scroll in my head. The trouble was, it was all special, the kind of equipment that isn't available to private citizens. The microvid was standard hardware for any TV stringer and its 'mayday' module could be removed in an instant. If I wound up as a morgue statistic

surrounded by superspy gadgetry, my government connection would be obvious. I didn't know how Dana's SAC would explain the alien hockey puck, but I knew they'd have a scenario for it. They always do.

I cursed myself for retreating down that mental trail, practically assuming failure, which could become a self-fulfilling prophecy. Night birds called in the distance, and told me the whispering whine of my turbo was loud only in my imagination. I released the folding floptop on the Porsche and let it settle noiselessly behind me, something I should have done earlier. I might be more vulnerable sitting in the open, but my eyes and ears were less restricted. My panoramic rearview commanded the upriver sweep, the big-bore automatic was in my hand, and the Porsche's tanks were full—well, nearly full. What was I worried about?

I was worried about that standing ripple a stone's throw off; hadn't it moved? I was spooked by the occasional splash and plop of feeding trout; were they really trout? I was antsy as hell over the idea that I might spend the next eight hours this way, nervous as a frog on a hot skillet, strumming my own nerves like a first-timer on a fruitless stakeout.

Recalling other vigils, days and nights of boredom relieved only by paperbacks and the passing human zoo with its infinitely varied specimens, I began to relax. The trout became just trout, the ripple merely a ripple, the faint billiard-crack of stones across the channel to my left, only a foraging raccoon. Soon afterward, another series of dislodged stones drew my interest. I decided my 'coon was a deer, and split my attention between the tailings and the innocent channel to my right. I'd been foisted once or twice by scufflers who melted away while I was concentrating on a spider or a housecat.

A third muffled cascade of stones, directly across on my left, no more than fifty yards away across the

narrow channel. With it came a faint odor, something like a wet dog, more like tobacco. I hoped to see a deer and that's what I saw, the biggest damn' buck I'd ever seen in those parts. It relieved me tremendously as it picked its way down toward the water. Though they're actually pretty stupid, deer know enough to stay well clear of predators. The buck that moved to the shoreline hadn't got that big by carelessness, I figured, which meant that the alien hunter almost certainly couldn't be nearby.

Well, I said 'almost'. In the back of my mind I'd been hoping to see something like that big buck; some evidence that the locale was safe for the likes of me. He picked his way along the shore, staring across in my general direction. As part of the dark mass of the Porsche among the scrub and weeds, I moved nothing but my eyes, happy to have him for a sentry on my left, and alert for anything that might be moving through the channel to my right.

It took the animal perhaps a minute to disappear up a ravine in the tailings—but long before that I began to feel a creeping dread. It came on with a rush as I strained to see the path of the buck along the water's edge. Where the 'buck' had made his stately promenade there was a new trail that gleamed wet in the overcast's reflection from the city, and instead of dainty hoofprints I saw deep pugmarks in the patches of sand. They seemed the size of dinner plates. I had wanted to see something safe, and I had seen it, and somewhere up in the tailings a fresh rumble told me the alien hunter was not far off.

I let the adrenal chill come, balled my fists and shuddered hard. If I couldn't trust my eyes or instincts, whatthehell could I trust? My ears; the hallucination had been visual, my eldritch buck larger than life, the clatter of stones a danger sign I had chosen to misinterpret.

I knew that my hunter—and the deadly semantics



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of that phrase implied 'the one who hunted me'—would make another approach. I didn't know when or how. Damning the soft whistle of the turbo, I fought an urge to put my foot to the floor, idly wondering what my traitor eyes would offer next as a talisman of safety. I'd made some new decisions in the past minutes: one, that the first thing I saw coming toward me would get seven rounds of heavy artillery as fast as I could pull the trigger.

I waited. I heard a swirl of water to my right, thought hard of trout, expected a shark-sized rainbow to present itself. Nothing. Nothing visual, at least—but in the distance was an almost inaudible hollow slurp as if someone had pulled a fencepost from muck. I opened my mouth wide, taking long silent breaths to fuel the thump between my lungs, and made ready to hit the rewind stud that would reel in the transmitting bait a few feet. I was leaning slightly over the doorsill, the spinning rig in one hand, the Smith & Wesson in the other, staring toward the dim outlines of weeds near my lure. I saw nothing move.

I could hear a distant labored breathing, could feel an errant breeze fan the cold sweat on my forehead, yet the stillness seemed complete. A cool and faintly amused corner of my mind began to tease me for my terror at nothing.

The truth telegraphed itself to the tip of my spinning rod; the gentlest of tugs, the strike of a hatchery fingerling, and in a silent thunderclap of certainty I realized that despite the breeze I had not seen the high grass move either, was hallucinating the visual tableau. To see nothing was to see safety. Not only that: I felt safe, so safe I was smiling. So safe there was no danger in squeezing a trigger.

I fired straight along the fishing line. Yes, god-dammit; blindly, since my surest instinct told me it was harmless fun.

When firing single rounds at night, you're wise to fire blindly anyway. I mean, blink as you squeeze; the muzzle flash blinds anyone who's looking toward it and by timing your blinks, you can maintain your night vision to some extent. In this case, I heard a hell of a lot, thought it all hilariously silly, but still I saw nothing move until after my second blink and the round I sent with it.

The second round hit something important because my vision and my sense of vulnerability returned in a flicker. Straight ahead of me, a great dark silvery-banded shape rolled aside with a mewling growl and crunch of brush, and I knew it would be on me in seconds. I floored the accelerator, hit the reel rewind stud, let the Porsche have its head for an instant holding the steering wheel steady with my knee.

Subjectively it seemed that the car took forever to gain momentum, pushing downslope through that rank tobacconist's odor. I dropped the automatic in my lap to steer one-handed, desperately hoping to recover the tiny transmitter.

As my Porsche whooshed to the water's edge I saw the hunter's bulk from the tail of my eye, its snuffling growl louder than its passage through the brush. I was twenty feet out from the shore when it reached the water and surged into the shallows after me. Only the downward slope of the channel saved me in that moment as the hunter submerged. A flash of something ivory-white, scimitar-curved, and the Porsche's body panel drummed just behind the left front wheel skirt. Then I scooted for the far shore.

I turned upstream at the water's edge, grasping the spinning rig, unwilling to admit that the spring-loaded rewind mechanism had reeled in nothing but bare line. The hunter had taken my lure; now I had no bait but myself. At the moment, I seemed to be enough.

Furious at my own panic, I spun the Porsche slowly so that it backed across the shallows. Apparently I could outrun the hunter, but it wasn't giving up yet. A monstrous bow wave paced me now, a huge mass just below the water. It was within range of my handgun but you can't expect a slug to penetrate anything after passing through a foot of water. I took my bearings again, seeing a sandbar behind me, and hovered toward it.

I saw massive humped shoulders cleave the bow wave, grabbed for my weapon, fired two more rounds that could not have missed, marveled at the hunter's change of pace as it retreated into deeper water. There was nothing for me to shoot at now, no indication of the hunter's line of travel. I angled out across the channel, knowing my pursuer was far too heavy to float and hoping 'deep' was deep enough. Every instant I had the feeling that something would lash up through the Porsche's bellypan until I heard the heavy snort from fifty yards downstream. I'd been afraid the damned thing could breathe underwater, but apparently it had to surface for breath just like any mammal. Chalk up one for my side.

Moving far across the sandbar, I settled the car and let it idle, waiting for the next charge, straining to hear anything that might approach. Under the whirl of possibilities in my head lay the realization that the hunter had lost or abandoned its habit of fooling me; since my second shot, my vision and hearing had agreed during its attacks. All the same, I didn't entirely believe my senses when the hunter splashed ashore a hundred yards downriver, bowling over a copse of saplings to disappear into the darkness.

The overcast was my ally, since it reflected the city's glow enough to reveal the terrain. I wondered where the hunter was going, then decided I might follow its wet trail if I had the guts. And since I didn't, that was when I thought of backtracking its spoor.

I traversed the river, guided my car up a tailings slope, cut power to a whisper. Standing to gaze over the windshield I could see where the 'deer' had moved over the tailings, leaving a dull dark gleam of moist trail on the stones. In a few minutes the stones would be dry. I spotted more damp stones just below the crest of the tailings ravine and followed.

Hardly half a mile downstream the trail petered out, the stones absorbing or losing their surface moisture. But the trail led me toward a bend in the river, and I could see a set of monster pugmarks emerging from the shallows.

I guessed I'd find more pugmarks directly across the river, but I didn't want to bet my life on it. The hunter could be anywhere, on either side of the river. I estimated that the brute couldn't travel more than thirty miles an hour over such terrain, and knew it had been within fifteen minutes of me when I unwrapped the transmitter. A seven-mile stretch? No, wait: I'd heard its original approach over a period of a minute or two, so it had been moving slowly, cautiously. My hunter had probably been holed up within a couple of miles of me—perhaps in its own vehicle somewhere deep in the river.

The Porsche was not responding well and, climbing out with my weapon ready, I inspected the car for damage. There was only one battle scar on it, but that one was a beaut: a clean slice down through the plastic shell, starting as a puncture the size of a pick-axe tip. It allowed the air cushion skirt to flap a bit behind the wheel well, and it told me that the stories about the hunter's sword hadn't been hogwash.

I tested my footing carefully, moved off from my idling machine, then squatted below the hillock crest so I could hear something besides the turbo. Again there came the lulling murmur of the river, a rustle of leaves applauding a fidget of breeze. No clatter of stones, no sign of stealthy approach. I wondered if I

had been outdistanced. Or outsmarted.

A subtle movement in the tailings across the river drew my attention. I wasn't sure, but thought I'd caught sight of stones sliding toward the river. Why hadn't I heard it? Perhaps because it was two hundred yards away, or perhaps because it suggested safety. I obeyed the hackles on my neck and slipped back to the Porsche.

As I was oozing over the doorsill I saw above the rockslide and watched a small tree topple on the dim skyline. An instant later came the snap of tortured green wood; I judged that the hunter was more hurried than cautious. Its wet trail would be fresh. I applied half throttle down the slope, passed across the river near enough to spot telltale moisture climbing the tailings, and gunned the turbo.

Twice I felt the car's flexible skirts brush protruding stones as I moved up the adjoining pile of tailings. I was trying to see everything at once: clear escape routes, dark sinister masses of trees poking up through the stones, my alien adversary making its rush over treacherous footing. When the Porsche dipped into the vast depression I nearly lost control, fought it away from the steep downward glide toward a hidden pool. I wasn't quite quick enough and my vehicle slapped the water hard before shuddering across the surface. I tried to accelerate, he felt the vibration through my butt and knew I'd drawn water into the air cushion fans. I'd bent or lost a fan blade—the last thing I needed now. Traveling on wheels was out of the question in this terrain; walking wasn't much better, and if I tried to move upslope again the unbalanced fan might come apart like a grenade.

I brought the Porsche to a stop hovering over water, checking my position. I'd found a big water pocket, one of those places where a rockslide shuts off a small

valley in the tailings and, over the years, becomes a dead lake. The tarn was fifty yards or so long, thirty yards wide; the water came up within fifteen yards of the crest. That was a hell of a lot higher than the river, I thought. The stones around the water's edge were darker for a foot or so above the water—whether from old stain or fresh inundation, I couldn't tell. Yet.

I felt horribly vulnerable, trapped there at the bottom of a sloping stone pit, knowing I couldn't be far from an alien hunter. The fan warning light glowed, an angry ruby eye on the dashboard. I let the car settle until its skirts flung a gentle spray in all directions, trying to stay afloat with minimum fan speed. If the fans quit, my Porsche would sink—and if I tried to rush upslope I would blow that fan, sure as hell. Nor could I keep hovering all night. Idle, yes; hover, no.

My own machine was making so much racket, I couldn't immediately identify the commotion coming from somewhere beyond my trap. Then, briefly, came a hard white swath of light through treetops that were just visible over the lip of the pit. A hovering 'copter—and a big one, judging from the *whock-whock* of its main rotors—was passing downriver with a searchlight.

The big machine lent momentum to the hunter: the huge beast came tearing over the lip of my pit in a sudden avalanche of stones large and small, twisting to lie flat, watching back toward a new enemy that shouted its way downriver.

The hunter was simply awesome, a quadruped the size of a shortlegged polar bear with the big flat head of an outsize badger. Around its vast middle, crossing over the piledriving shoulders, ran broad belts that could have been woven metal. They held purses big as saddlebags on the hunter's flanks. The beast's weight was so tremendous that the stones beneath it shifted like sand when it moved suddenly; so powerful that it

had plowed a furrow through the tailings crest in its haste to find shelter. But with such a mass it couldn't travel in this terrain fast unless it made a big noise and a furrow to match. It hadn't, until now. Once again I revised my estimate of its den, or vehicle. The hunter couldn't have started toward me from any great distance.

I had a clear field of fire as the searchlight swept my horizon again, but the hunter was fifty yards away; too far to risk wasting a single round. It was intent on the big 'copter and hadn't seen me yet. I gunned the Porsche directly across the water, intending to make one irrevocable pass before angling upslope on my damaged fans toward the river. There should be time for me to empty the Smith & Wesson.

There should have been, but there wasn't.

Alerted by the scream of the turbo and the squall of galled fan bearings, the hunter rolled onto its back, sliding down in my direction, forepaws stretched wide. I saw a great ivory blade slide from one waving forepaw, a retractable dewclaw as long as my forearm, curved and tapered. The hunter scrambled onto its hind legs, off-balance on the shifting stones but ready for battle.

I wrenched the wheel hard, trying to change direction. Crabbing sideways, the Porsche slid directly toward certain destruction as the hunter hurled a stone the size of my head. I was already struggling upright, trying to jump, when the stone penetrated body panels and cannoned into the chassis.

I think it was the edge of my rollbar that caught me along the left breast as the Porsche shuddered to a stop under the staggering impact. That was then the forward fan disintegrated and I fell backward into the pool. Blinding pain in my left shoulder made me gasp. I shipped stagnant water, almost lost my grip on the weapon in my right hand, but surfaced a few yards from the great beast. It was at the pool's edge as

I raised the Smith & Wesson, but the convulsion of my spluttering cough made me duck instead of firing.

The hunter had another stone now, could have pulped me with it, but poised motionless over me; immeasurably powerful, looming too near to miss if it chose to try. I jerked a glance toward the Porsche, which had slowly spun on its aft fan cushion toward deeper water before settling into the stuff. My car began to sink, nose tilted down, and the hunter emitted a series of loud grinding clicks as it watched my car settle. It didn't seem to like my car sinking any better than I did.

Since I'd originally intended to simply immobilize the brute, why didn't I fire again? Probably because it would've been suicide. The hunter held one very deliberate forepaw out, its palm vertical, then lobbed the stone behind me. It was clearly a threat, not an attack; another stone, easily the size of a basketball, was tossed and caught for my edification. When the dewclawed paw waved me nearer, I came. There was really no choice. The effort to swim made my shoulder hurt all the way down to my belly, and the grating of bone ends told me I had a bad fracture.

The damned shoulder hurt more every second and, standing in the shallows now, I eased my left hand into my belt to help support my useless left arm. No good. Without releasing the drenched Smith & Wesson which might or might not fire when wet, I ripped a button from my shirt and let the gap become a sling. Not much better, but some. The hunter towered so near I was blanketed by the rank bull durham odor; could actually feel the heat of its body on my face.

Again the hunter slowly extended both forepaws, digits extended, palms vertical. There was enough cloud reflection for me to see a pair of flat opposable thumbs on each paw, giving the beast manipulation skills without impeding the ripping function of those

terrible middle digits.

I stuck the pistol in my belt and held up my right hand, and not all of my trembling was from pain. But I'd got it right: my enemy had signaled me to wait. I was willing enough. Just how much depended on that mutual agreement, I couldn't have imagined at that moment; I figured it was only my life.

Still moving with care and deliberation, the hunter retracted the swordlike dewclaw and fumbled in a saddlebag, bringing forth a wadded oval the thickness of a throw rug. It glowed a dim scarlet as it unfolded and became rigid, two feet across and not as flimsy as it had looked. Around the flat plate were narrow detents like a segmented border. I squinted at it, then at the bulk of the hunter.

The glow improved my vision considerably; I could see three smallish lumps through the bristly scant fur of the hunter's abdomen, and a greatly distended one, the thickness and length of my thigh, ending in a pouch near the hind legs. I took it to be a rearward-oriented sex organ. In a way, I was right.

The hunter sat back with a soft grunt, still looming over me, watching with big eyes set behind sphincter-like lids. I didn't make a move, discounting the sway when I yielded to a wave of pain.

The hunter propped the glowing plate against one hind leg and ran its right 'hand'—obviously too adroit to be merely a paw—along the edge of the plate. I saw a slow rerun of myself squinting into my own face, looking away, trying not to fall over. It made me look like a helpless, waterlogged fat man.

Then the display showed a static view of me, overlaid by others, as a series of heavy clicks came from the plate. The picture became a cartoonish outline of me. After more manipulation by the hunter, the cartoon jerkily folded into a sitting position. The hunter looked at me, thumbed the margin of the plate again. The cartoon sat down again. So did I.

The hunter placed its left 'hand' to its chest and made a big production of letting its eyelids iris shut.

"What the hell does that mean," I said.

Instantly the eyes were open, the dewclaw extended and waving away in what I took to be a slashing negation.

I knew one sign: 'wait'. I raised my empty hand, palm out, and thought hard. Humans have a lot of agreed-upon gestures that seem to be based on natural outcomes of our bodies and their maintenance. But we're omnivores. Pure predators, carnivores like the great cats, have different gestural signs. I didn't know the hunter was in either category but you've got to start somewhere.

I cudgeled my memory for what I'd read of the ethologists, people like Tinbergen and van Iersel and Lopez, whose books had helped me live with a cheetah. The slashing motion was probably a mimed move of hostility, a rejection. Maybe it was hunterese for 'no'.

To test the notion, I made an obvious and slow gesture of reaching for the automatic in my belt. The eyes irised, the dewclaw slashed the air again as easily as it could have slashed me. I started to say something, suddenly suspected that the hunter didn't want me to talk. I remembered something about speech interfering with gestural language, then pointed to the weapon with my finger and made a throwing-away gesture of my own.

Distinctly and slowly in the red glow, the hunter folded its left hand to its breast and closed its eyes in a long blink. I brought my good hand to my breastbone and blinked in return. It made sense: if an intelligent predator closes its eyes and withdraws its natural weapon from sight, that compound gesture should be the opposite of hostility. Unless I was hopelessly—maybe fatally—wrong, I had signs for 'no' and 'yes' in addition to 'wait'.

The hunter's next attempt with the display took longer, with several evidently botched inputs. It seemed to breathe through a single sphinctered nostril in its muzzle, and the snuffling growl of its breath was irregular. I began to wonder if any of those drugged bullets was having an effect; tried not to cough as I watched. My chest hurt, too—not with the spectacular throb of my collarbone but enough to make me short of breath.

The dimness of the display suggested that the hunter could see infrared, including the heat signatures of prey, better than I could. That display was now showing a cartoon of the hunter and of me, gesturing, while clouds of little dots migrated from each head to the other. Germs? Were we infecting each other?

The hunter pointed a thumb at the display. Sign: 'yes'. Then the display, under the hunter's guidance, stopped the gestures and the dots flowing from my side. The next cartoon was pellucid and coldblooded, as the figure of the hunter slashed out at the me-figure. The human part of the display disintegrated into a shapeless mass of dots. The hunter tapped the display plate and signed, 'no'.

If the hunter wanted those dots to pass between us, they must mean something useful. If not germs, then what? If I stopped gesturing, the dots stopped. Uh-huh! The dots were communications; messages. There was an assumption built into the display sequence: it assumed that our brains were in our heads. For all I'd known, the hunter's brain might've been in its keester.

So I was being warned to cooperate, to talk or I'd be dead meat. I signed 'yes' twice and coughed once, tasting salt in my mouth.

The display went blank, then showed the hunter sketch without me. Not alone, because from its bulging pouch a small hunter's head protruded, biting on

the prominent sex organ of the big beast. Not until then did I harbor a terrible surmise. I pointed from the display to the hunter, and I was close enough that I could point specifically at the big swollen organ.

She lifted the long dribbling teat from her pouch, and she signed, 'yes'.

She. Oh sweet shit. The hunter was a huntress, a female with a suckling babe, and I'd mistaken the lone functioning teat for a male organ. But she had no suckling babe, as she indicated by patting the empty pouch. No, and she wouldn't ever have it again. The little one had been an infant, not a pet. It hadn't been entirely our fault but I felt we, the human race, stumblebums of the known universe, had killed it. Or let it kill itself, which was almost as bad.

My fear of the revenge she might take—and a pang of empathy for a mourning mother of any species—conspired to make me groan. That brought on a cough, and I ducked my head trying to control the spasm because it hurt so goddam much to cough. I wasn't very successful. Luckily.

When I looked up again, the huntress was staring at me, her head cocked sideways in a pose that was almost human. Then she spread the short fur away from her belly with both hands and I saw a thick ooze of fluid that matted the fur there. When she pointed at the weapon in my belt, then at the puncture wound, I knew at least one slug had penetrated her flesh. But it might have been from the guy she'd met with the new rifle. Not likely: she had specifically indicated my weapon. When she ducked her head and grunted, I cocked my own head, waiting. She repeated the charade, complete with the series of coughing grunts and ducked head, as if imitating me.

By God, she *was* imitating me. It didn't take a Konrad Lorenz to know when an animal is in pain, and she was generating a sign for 'hurt' that was based on my own behavior.

I signed 'yes'. Staring at the woven belt that bandoliered over her shoulders, I saw that another slug had been deflected by a flat package with detent studs—pushbuttons for a big thumb. The studs were mashed, probably deformed by the slug's impact, and while I may never know for sure, I suspect that little package had been responsible for the hallucinations before I put it out of commission.

The huntress was punching in a new display. Images fled across the screen until she had the one she wanted, a high-resolution moving image. Somehow I knew instantly it was a family photo, my huntress lounging on a sort of inflated couch while another of her species, slightly smaller and with no pouch, stood beside her leaning on a truly monstrous dewclaw like a diplomat on his umbrella. Proud father? I think so. He—it—was looking toward the infant that suckled in her protective custody.

The huntress pointed at her breast, then at the image to assure me that the image was indeed of her.

I gave a 'yes', managing to avoid another cough which could have been misinterpreted. I was beginning to feel cold; on hindsight I suppose it was mild shock. If I fainted, I'd stop communicating. The huntress had made it very clear what would happen if I stopped communicating.

From a saddlebag she drew the little transmitter she'd stolen back from me, still in the sewn-up pocket. She developed a cartoon of the disc, gestured to show it represented the real one, adjusted the display. The disc image floated across the display to the now-still-shot of the infant. She stared at me, unmoving.

Of course I understood. I signed 'yes'.

She patted her empty pouch, held both hands out, drew them toward her. In any language, a bereft mother was imploring me for the return of her baby.

I signed 'no', then gritted my teeth against the fit of

coughing that overtook me, and this time I knew the salt taste was blood in my throat. When I looked up, I knew the cough had saved my life; the dewclaw was an inch from my belly, and she was dribbling something like dark saliva from her fanged mouth while she insisted 'yes', and 'yes' again.

I ducked my head and formally grunted. I was hurt, I was sorry. I pointed to the image of the infant hunter, made the negative sign again, again the sign for my pain. Anguish can be mental, too; we seemed to agree on that.

She withdrew the threatening scythe, wiped her mouth, changed the display again. Now it was an image of the infant with an image of me. Expectant stare.

I denied it, pointing off in the distance. She quickly multiplied the image of me, made them more slender. Other men had her baby? I agreed.

She showed another swarm of dots moving between her baby and the men's images, waited for my answer.

Negative. Her baby wasn't communicating with us. I don't know why I told the truth, but I did. Eventually she'd get around to the crucial question. If I lied she might take me hostage. If I told the truth she might mince me. She sat for a long moment, swaying, staring at me and, if the dark runnel meant what I think it did, sobbing. I also think she was as nearly unconscious as I was.

At last she fumbled the display into a single outline of her baby, then—with evident reluctance—made an adjustment. The image collapsed into shapeless fragments.

I started to make the 'pain' sign, but it developed into the real thing before I could recover. Then I signed 'yes'. Her baby was dead.

She tucked her muzzle into forearms crossed high, soft grinding clicks emanating from—I think—some



head cavity, swayed and snuffled. Not a message to me or anyone else. A deeply private agony at her loss.

My next cough brought enough blood that I had to spit, and I put one hand out blindly as I bowed to the pain. I felt a vast enveloping alien hand cover my own, astonishingly hot to the touch, and looked up to find her bending near me. Her tobacco-like exhalation wasn't unpleasant. What scared me was the sense of numbness as I tried to get my breath. I slumped there as she withdrew her big consoling hand, watched dully as she pointed to the image of the infant's remains.

She motioned that she wanted the body. I thought if I stood up, I could breathe. I signed 'yes' and 'no' alternately, then tried an open-handed shrug as I struggled to my feet. It helped, but even as I was making the sign for her to wait, she kept insisting. Yes, yes, give me my baby. The big dewclaw came out. I couldn't blame her.

But the only way I could get her baby back was by calling a mayday, and my microvid with its transmitter was in the sunken Porsche. As I turned, intending to gesture into the pool, I saw that the Porsche hadn't completely sunk after all, was floating still. Maybe I could find the microvid. I stumbled backward as the huntress lurched up to stop me, signing negation with murderous slashes.

She came as far as the shallows, erect, signing for me to wait as I kicked hard in the best one-armed sidestroke I could manage. I was giddy, short of breath, felt I wasn't going to make it; felt the grating in my collarbone, told myself I *had* to, and did.

My next problem was getting into the car and, as my feet sank, they touched something smooth below the car. My mind whirled, rejecting the idea that the bottom was only two feet down. But a faint booming vibration told me the bottom was hollow. Then I knew where the huntress kept her vehicle. My

Porsche had settled squarely atop an alien ship, hidden beneath the surface of that stagnant pool.

I got the door open, sloshed inside, managed to find the microvid with my feet and brought it up from the floorboards with my good hand, coughing a little blood and a lot of water. The car's running lights worked even if the headlights were under water, and I found the mayday button before I aimed the gadget toward the huntress. She had staggered back to shore, dimly lit by the glow of the Porsche's rear safety lights, and was gesturing furiously.

As near as I could tell, she was waving me off with great backhanded armsweeps. She pointed down into the pool, made an arc with her dewclaw that ended in a vertical stab. I could barely see her but thought I understood; it wouldn't be healthy for me to stay there when she lifted off. I agreed and signed it, hoping her night vision could cope with my message, showing her my microvid and signing for her to wait.

The last I saw of her, the huntress was slowly advancing into the depths of the pool. She was signing, 'No! Clear out'.

I wanted to leave, but couldn't make my muscles obey. I was cold, freezing cold; bone-shivering, mind-numbing cold, and when I collapsed I lost the microvid over the side.

Not far out from the Porsche, a huge bubble broke the surface, a scent of moldy cavendish that must have come from an alien airlock. *They aren't really all that different from us, I thought, and I wish I could've told somebody that and ohjesus I can feel a vibration through the chassis. Here we go . . .*

Olfactory messages have got to be more basic than sight or sound. By the smell of starch and disinfectant, I could tell I was in a hospital long before I could make sense of the muttered conversation, or recog-

nize that the buttercup yellow smear was featureless ceiling. In any case, I didn't feel like getting up right then.

Just outside my private room in the hall, a soft authoritative female voice insisted that she would not be pressured into administering stimulants at this time, exclamation point. Rackham had bled a lot internally from his punctured lung, and the ten-centimeter incision she'd made to reposition that rib was a further shock to his system, and for God's sake give the man a chance.

Other voices, one female, argued in the name of the national interest. If the good doctor watched newscasts, she knew Harvey Rackham was in a unique position vis-a-vis the human race.

The doctor replied that Rackham's position was flat on his arse, with a figure-eight strap holding his clavicle together and a pleurovac tube through his chest wall. If Miz Martin was so anxious to get stimulants into Rackham, she could do it herself by an old-fashioned method. Evidently the doctor had Dana Martin pegged; that was the first time I ever knew that caffeine can be administered as a coffee enema.

A vaguely familiar male cadence reminded the doctor that Rackham was a robust sort, and surely there was no real risk if his vital signs were good.

The doctor corrected him. Vital signs were only good considering Rackham's condition when the chopper brought him in. His heartrate and respiration were high, blood pressure still depressed. If he carried twenty less kilos of meat on him—at least she didn't say 'flab'—he'd be recovering better. But the man was her patient, and she'd work with what she had, and if security agencies wanted to use Rackham up they'd have to do it after changing physicians. Then she left. I liked her, and I hadn't even seen her.

Dana Martin's trim little bod popped into view

before I could close my eyes; she saw I was awake. "Harve, you've given us some anxious hours," she scolded cutely.

I'd heard some of that anxiety, I said, and flooded her with questions like the time of which day, how long would I be down, where was the alien, did they know it was a female.

"Hold on; one thing at a time, fella." Scott King stepped near, smiling, welcoming me back as if he meant it. Scotty, Dana's area SAC, was an ex-linebacker with brains. I'd met him years before; not a bad sort, but one who went by the book. And sometimes the book got switched on him. From his cautious manner I gathered he was thumbing through some new pages as he introduced me to Señor Hernen Ybarra, one of the non-permanent members of the U.N. Security Council. Ybarra, a somber little man in a pearl-grey summer suit that must have cost a fortune, showed me a dolorous smile but was barely civil to the two Feebies, managing to convey that there was nothing personal about it. He just didn't approve of the things they did for a living.

I put my free hand out, took Ybarra's. I said, "Security Council? Glad to meet a man with real clout."

The eyes lidded past a moment's wry amusement. "A relative term," he assued me. "Our charter is to investigate, conciliate, recommend adjustments, and—" one corner of his mouth tried to rebel at the last phrase, "—enforce settlements."

"What's wrong with enforcement, *per se*? I've been in the business myself."

With softly accented exactness: "It is an egregious arrogance to speak of *our* enforcing a Sacramento settlement."

"The clout is with the hunting people," Dana chimed in, patting my hand, not letting it go. Her sex-appeal pumps were on overdrive, which meant she was on the defensive.

I let her think I was fooled. "Hunting people? You've found more, then?"

"They found us," King corrected me, "while we were draining that sinkhole in the middle of the night. Smart move, immobilizing that shuttle craft by parking on it. We owe you one."

I thought about that. "The huntress didn't lift off, then," I said, looking at King for confirmation.

A one-beat hesitation. "No. Paramedics realized you were lodged on top of something when they found you. The most important thing, right now, is whether you had any peaceful contact with the female hunter before you zapped each other."

"Is anybody taping us now?"

Ybarra and King both indicated their lapel units with cables snaking into coat pockets. "Rest assured," King said laconically.

I told them I'd managed a couple of lucky hits with the medicated slugs. When I mentioned that the visual hallucinations and the shallow whatthehell feeling stopping after I hit a piece of the huntress's equipment, a sharp glance passed between Ybarra and King.

"So: it would seem not to be an organic talent," Ybarra mused with relief. "Go on."

I gave a quick synopsis. The hovercraft that passed downriver—chartered by Chinese, Ybarra told me—the way I'd managed to get myself walloped when falling from my Porsche, my sloppy sign language with the huntress, my despairing retreat to the half-sunken car to find my microvid.

"So you made no recording until you were safely distant," Ybarra muttered sadly, sounding like a man trying to avoid placing blame. "But still you were making sign language?"

"Mostly the huntress was doing that. She wanted me the hell out of there. I wanted to, believe me."

King, in hissing insistence: "*But where is the mi-*

crovid unit?"

"You'll find it in the pool somewhere," I said. The shrug hurt.

King shook his head. "No we won't. Maybe the hunting people will." At my glance he went on: "Pumping out the pool must have given them a fix. They came straight down like a meteorite and shooed us away before dawn this morning. No point in face-to-face negotiation; anybody that close, acts like he's on laughing gas. But they've been studying us awhile, it seems."

"How'd they tell you that?"

"Clever system they have," Ybarra put in; "a computer-developed animation display that anyone can receive on VHF television. The hunting people make it clear that they view us as pugnacious little boys. The question before them, as we understand it, is whether we are truly malign children."

"You can ask the huntress. She's reasonable."

"That is what we cannot do," Ybarra said. "They acknowledge that the female came here mentally unbalanced."

Scotty King broke in, waving his hand as if disposing of a familiar mosquito: "Spoiled young base commander's wife; serious family argument. She takes their kid, steals a jeep, rushes off into cannibal country. Kid wanders off; distraught mother searches. Soap opera stuff, Harve. The point is, they admit she was nuts."

"With her baby dead from cannibal incompetence," I added, spinning out the analogy. "Who wouldn't be half crazy? By the way, what base do they command?"

King looked at Ybarra, who answered. "Lunar far-side; the Soviets believe their site is just beyond the libration limit in the Cordillera chain. The hunting people are exceedingly tough organisms and could probably use lunar mass to hide a fast final approach

before soft-landing there."

"You don't have to tell me how tough they are," I said, "or that we reacted like savages—me included."

"It is absolutely vital," Ybarra said quietly, "that we show the hunting people some sign that we attempted a friendly interchange. If we cannot, our behavior is uniformly bad in their view. Some recording of your sign talk is vital," he said again.

"Find the microvid. Or bring me face to face with the huntress, since she didn't lift off after all." I brightened momentarily, trying to be clever: "The vital signs are hers, after all."

Silence. Stolid glances, as Dana withdrew her hand.

"You may as well tell him," Ybarra husked.

"I wouldn't," Dana warned. She knew me pretty well.

Scotty King: "It took a half-hour to find you after your mayday, Harve; and two hours more to pump the water down to airlock level. The female had turned on some equipment but she never tried to lift off. There were no vital signs when we reached her."

Dana Martin cut through the bullshit. "She's dead, Rackham. We don't know exactly why, but we learned that much before their second ship came barreling in."

I made fists, somehow pleased at the fresh stabbing twinge through my left shoulder. "So I killed her. No wonder you're afraid of a global housecleaning."

King: "Not much doubt they could do it."

"And they might exercise that option," Ybarra added, "without a recording to verify your story."

Dana Martin sought my gaze and my hand. "Now you see our position, and yours," she said, all the stops out on her Wurlitzer of charm.

I pulled my hand away. "Better than you do," I growled. "You people have taped this little debriefing. And the flexible display the huntress used

seemed to have videotape capability, or it couldn't have developed an animation of me on the spot. She was taping, too, out there on the rockpile."

King, staccato: "Where is her recording?"

"Ask the hunting people." My voice began to rise despite my better judgment. "But don't ask anything more from *me*, goddam you! Take your effing debrief tape and run it for the hunting people. Or don't. Just get out and leave me alone."

Scott King cleared his throat and came to attention. "We are prepared, of course, to offer you a very, very attractive retainer on behalf of the State Department—"

"So you can pull more strings, hide more dynamite, slip me another weapon? Get laid, Scotty! I've had a gutful of your bloody mismanagement. My briefings were totally inadequate; your motives were short-sighted; the whole operation was half-assed, venal and corrupt."

Dana abandoned the cutesypie role; now she only looked small and cold and hard. "How about your own motives and venality?"

"Why d'you think I'm shouting," I shouted.

King became stiffly proper. "Let me get this straight for the record. You won't lift a hand for the human race because you're afraid to face the hunting people again."

"Don't you understand anything, asshole? I'm not afraid: I'm *ashamed!* That grief-stricken predator showed more respect for life processes than all of us put together. In the most basic, vital way—the huntress was my friend. You might say yes when your friend says no, but once you've agreed to defer a selfish act you've committed a friendly one."

Ybarra had his mouth ready. "Don't interrupt," I barked. "The first agreement we made was to hold back, to confer; to wait. I know a cheetah named Spot who wouldn't waste a second thought on me if he

thought I'd had anything to do with killing one of his kits. He'd just put me through Johnny Rubeck's machine. And I wouldn't blame him."

Ybarra's face revealed nothing, but King's was flushed. "You're inhuman," he said.

"Jesus, I hope so," I said, and jerked my thumb toward the door.

Well, I've had a few hours to think about it, mostly alone. What hurts a lot more than my collarbone is the suspicion that the huntress waited for me to clear out before she would move her ship. Okay, so she'd wasted some lives in her single-minded desperation to recover her child. In their ignorance those killed had been asking for it. Me? I was begging for it! It was no fur off her nose if I died too, and she was lapsing into a coma because I'd shot her full of drugs that may have poisoned her, and other humans had used her own baby's tissues to fashion weapons against her. And there she sat, for no better reason than an uncommon decency, waiting. And it killed her.

It's bad enough to get killed by enmity; it's worse to get it through friendship. In my friend's place, I know what I'd have done, and I don't like thinking about that either. When you're weak, waiting is smart. When you're strong, it's compassion. Compassion can kill you.

As soon as I get out of here I'm going into my smithy in the shadow of Mount Diablo and pound plowshares for a few weeks, and talk to Spot, and mull it over.

If I get out of here. Nobody seems very anxious to stick to the hospital routines; they're all watching the newscasts, essentially doing what I'm doing.

What the hunting people are doing.

Waiting.

—Dean Ing

NUCLEAR SURVIVAL

PART ONE:

GIMME SHELTER!
BY DEAN ING



THE USSR IS EFFECTIVELY PROTECTED. THE USA IS NOT.

A generation ago, Herman Kahn urged us to think about the unthinkable: nuclear war. He then proceeded to scare the hell out of us with his own scenarios on megadeath and civil defense (CD). Soon afterward we were deluged with plans, arguments for and against fallout shelters, and an open letter to the public by then-President John Kennedy. The President, New York Governor Nelson Rockefeller, Kahn, and many others were strongly in favor of public shelter programs in view of the awesome destructive power of nuclear weapons.

A loyal opposition quickly emerged, notably from a phalanx of educators in the Boston area and in the pages of the *Bulletin of the Atomic Scientists*. Freeman Dyson's argument was succinct: nuclear nations should *not* build shelters on a large scale because, while a lack of effective shelters may mean death for a warring nation, effective shelters may mean death for the entire human race. Dyson reasoned that effectively sheltered antagonists would go on pounding away at each other until not only the duelists, but the whole world, was fatally contaminated. Better that the warring nations die alone, he

concluded, than to drag all mankind down with them.

Dyson did not deal with the obvious, e.g., what happens when one duelist is protected and the other is not. We must deal with it now. Relatively speaking, the USSR is effectively protected. The USA is not.

Now that we have your full attention, let us remind you that Dyson warned us against shelters *on a large scale*. If a few thousands or millions of us choose to survive on a small scale, it shouldn't affect first-order terms of the megadeath equation very much.

No one can know today whether our lives would be worth living after a nuclear war, and we won't dwell on the moral questions of the individual's responsibility to oneself and to others. For the ultimate amorality, the survivor who envies the dead can join them any time he chooses. But you ought to have the option of nuclear survival, and that option starts with information. We can't expect to be as effective as the USSR has been in training tens of millions of Soviet citizens as a survival cadre, but we can help a few to train themselves. Much of the information is basic. For many of us, particularly urbanites, it begins *before* we step into a fallout shelter. This article is a beginning. Subsequent articles will show how, with a little foresight, you might reverse the odds against yourself once a shelter is reached.

In the 1950's we knew that the 20 KT (equivalent to twenty thousand tons of TNT) Hiroshima blast was almost insignificantly small compared to 20 MT—megaton—and larger weapons then in development. Was the public interested? Not much, until Kahn popularized the mathematics of annihilation and helped provoke the great shelter debate of the sixties. Suddenly in 1961 we were more than interested; we were fascinated, and then inundated by a tsunami of articles, pamphlets and books. Like the European tulip craze of the 17th Century and our Muckraker

Era after 1900, the topic blazed into focus. It didn't stay long; anyone can see by checking the Reader's Guide to Periodicals that by 1963, the topic was plummeting from public view. By 1979 it had fallen almost out of sight.

For several reasons, the U.S. public largely abandoned civil defense matters until very recently; and now the rules have changed! Government agencies spent most of a billion dollars locating and stocking potential fallout shelters in urban areas. With all those signs telling us where to go, we'd be okay when we got there; right?

Wrong. Language sets its own tripwires, and in our focal effort to find fallout shelters, we concentrated altogether too much on only one danger, i.e., fallout. Quick, now: how many victims in Hiroshima and Nagasaki succumbed to fallout? Evidently none. The bombs were detonated high in the air for maximum effect against the two cities. An air burst does its damage as a one-two-three-four punch. First comes the thermal radiation, moving out from the fireball core at light speed and lasting something under one minute. Next comes the blast wave, a hammerblow of air moving a bit faster than Mach 1 that can reduce nearby concrete structures to powder, the range of blast destructiveness weakening with the cube root of the bomb's energy. This means that a 20 MT bomb's blast effect reaches only (!) ten times as far as that of a 20 KT bomb. Third comes the firestorm, a genuine meteorological event caused by the burning of everything ignitable within range—and that encompasses many square miles—of the initial heat effects. Last and most lingering comes the fallout, a rain of deadly radioactive ash from the mushroom cloud that moves downwind.

The bigger the bomb, the more preponderantly it is an incendiary weapon. Victims of conventional Allied incendiary air raids in World War II were found

suitably protected from blast effects in shelters—suffocated and cremated by the firestorms that ensued. Even without nukes the toll was 200,000 in Tokyo, 300,000 in Dresden. In New York City fallout shelters, the toll might be twenty times as high, because the first bomb targeted against a big city will almost certainly be an air burst with appalling incendiary effects. Suburbanites far downwind may live long enough to worry about fallout.

The ground burst is the one that punches a vast depression in the earth and sends thousands of tons of vaporized dirt into the air. We can expect ground bursts against deeply-buried military installations and other 'hard' targets. The fallout from a ground burst may be lethal hundreds of miles downwind, because the vaporized dirt will condense and drift down as radioactive ash—thousands of tons of it.

Incidentally, because so much of the ground burst's energy goes into punching that hole in the ground, the blast and initial radiation effects of a ground burst will not be as widespread. Your chances a few miles from a ground burst can be better than the same distance from an air burst, if you're far enough upwind, or sheltered well enough, to avoid fallout from the ground burst. But that mushroom cloud will be miles across; and if I'm near it, gimme shelter!

But what *is* effective shelter? Not an ordinary urban basement. Probably not even a subway tunnel, unless the tunnel can be hermetically sealed against the firestorm. Imagine a gopher in his tunnel, with openings fifty feet apart—under a bonfire a hundred feet across. The fire will rage for hours, causing up-drafts of hurricane force toward the center that suck air right out of the tunnels. It simply withdraws the little varmint's oxygen while the heat gradually builds up deep beneath the bonfire. Well, a big fire-storm is a miles-wide bonfire, and our subway commuter is the gopher. The Soviets have given that a lot

of thought. Unlike us, according to Leon Gouré, they've done something about it.

Gouré, a RAND Corporation man, emigrated from Moscow in infancy and revisited the USSR in 1960. He found huge blast doors set into the floors of Moscow subway tunnels—and we can take hermetic seals for granted. Moscow might burn, but a million or so Muscovites can keep on breathing. Gouré also learned that Soviet civil defense officials, the MPVO (for Mestnaia Protivovoz-dushnaia Oborona, so from now on we'll just give acronyms; trust us, okay?), can call on twenty or thirty million members of a paramilitary civilian cadre called DOSAAF. DOSAAF people correspond roughly to a national home guard, and they all get compulsory training as population leaders in evacuation and shelter exercises.

The Soviets, with total control over the architecture of apartment buildings as well as municipal structures, have very special building codes for urban basements. Many apartment building basements have specially reinforced, thick ceilings and walls with load-bearing partitions and airtight steel doors. In addition, ventilation tunnels filter incoming air and provide remote emergency escape passages. Gouré cited toilet facilities, stored food and water with other supplies, and implied that bottled air may be provided. Thus protected, Soviet apartment dwellers just might live through all but the fiercest fire-storm.

It's possible for us to build better urban shelters than these, but we do not appear to be doing it. Our civil defense posture has regeared itself more toward evacuation than to digging in. More accurately, at the moment we're between gears, idling in neutral.

A recent Boeing study revealed to a Congressional committee that, with its low-key, continuing civil defense; its carefully dispersed industry; and its less centralized population, the USSR might recover

from a war in two to four years while the U.S. might need twelve years for recovery. Two per cent of the Soviets might die. Sixty per cent of Americans might die. Now do you see why the Soviets marched into Afghanistan with such confidence?

Anecdote time: we know a scientist who fled the Soviet bloc some years ago. Her eyewitness report on Soviet civil defense is more recent than Gouré's, and perhaps more scarifying. She insists that the USSR and its satellite countries feel confident that their people would easily survive a nuclear war because of their massive compulsory CD programs. Now in the U.S., our scientist friend moved as far from local target areas as she could, and modified her basement into an acceptable fallout shelter. She's still dismayed that her American friends have no hermetically sealed public tunnels and that they consider her efforts, in word, weird.

China has her tunnels, too. Less elaborate than Moscow subways, Peking's tunnels are only a few meters below the surface and probably would be employed as an escape route to the countryside. Dairen, a big shipping port, is a likely target and its deep tunnels are stocked for 80,000 evacuees. The tunnels criss-cross like a bus network and might be marginally suitable if they are effective conduits beyond the firestorm area.

Canada has her National Shelter Plan, several years in arrears of our own and still geared to identifying mass fallout shelters for urbanites. Undeniably, Canada harbors fewer prime targets than we do in both major categories; the hardened military sites for which ground bursts are slated, and the soft population targets so vulnerable to air bursts. But Canada's cities are just as vulnerable as ours. She needs an urban public that's drilled as well in evacuation as in cellar-dwelling, just as we do.

From all evidence, both U.S. and USSR civil de-

fense officials count on being alerted many hours or even days before Time Zero, apparently on the basis of judgments of political events and evidence that the other side is battening down its hatches. This is a gamble we take collectively; but you, *personally*, don't have to take all of that gamble.

So how do you reduce the gamble to your immediate family? Being painfully aware that you may find some of the answers very unpleasant, we'll start with some generalizations, and some specifics.

1. Talk to your local CD coordinator, who may be making do with absurdly low federal and local funding. Local officials usually have expert guesses as to the nearest target area. What common carriers are earmarked for evacuation? What should you carry with you? Where will you go and what facilities will you find there? Ask for a copy of the 1977 booklet, *Protection in the Nuclear Age*, or borrow theirs and copy it. The booklet strongly reflects the shift in emphasis toward evacuation—or in CD jargon, 'Crisis Relocation'. Among other things the booklet describes home shelters of several kinds, a source of free shelter plans, and your best tactics in evacuating a target area.

2. If you live or work in a primary target area, for God's sake seek other stomping grounds. This is far and away the best item in improving your chances—and the toughest one to implement.

3. Do your homework on fallout, prevailing winds, and target areas upwind of you. The November 1976 *Scientific American* is a good departure point.

4. More homework. Make a low-key, consistent hobby of studying survival and technology. Oldies like *Fortunes in Formulas* and any decent encyclopedia set may be more helpful than books on woodcraft. If you wind up in the woods you either know your stuff already, or you're up the creek without a scintillator. Mel Tappan's column on survival has

been a fixture in *Guns & Ammo* magazine since December, 1976, and Tappan is no wild-eyed troglodyte. His argument in favor of living in a smallish town, rather than metropolis or mountaintop, is eloquent.

5. Fill a scruffy rucksack with raisins and jerked meat, transistor radio, masking tape and monofilament line, first-aid equipment including water purification tablets, a few rolls of dimes, leather gloves, vitamins, steel canteen, thermally reflective mylar blanket from any outfitter, good multipurpose clasp knife, and so on. You might have to change plans and relocate without notice. We spent an evening once at Poul Anderson's place with several writers, arguing the merits of a survival kit that was originally stored in a certain specially-stiffened Porsche coupe. Basically, our kit was intended to get a tinkerer across country. It didn't look worth stealing. That's a vital point: when you can't expect a policeman to help, keep a low profile.

The kit had some of the items mentioned above, plus small slide rule, pliers, drill bits, wire and needles, compass, fishhooks, wax-coated matches and candle stub (a plumber's candle is high in stearic acid and burns very slowly), thick baggies, pencils and pad, all wrapped in heavy aluminum foil so that it could be swung like a short club. Huge half-inch-wide rubber bands looped around the handle end. Never forget that a slingshot with big rubber bands is quiet and flashless, and ammunition for it is everywhere. Why the masking tape? Whether you stay put or evacuate, you may need to tape cracks around openings to make your quarters as airtight as possible. Freshen the kit annually.

Pamphlets suggest you may have two days' warning. Don't bet your life on it.

No booklet can possibly cover all the problems you're likely to find if you choose crisis relocation,

i.e., evacuation after the alert sounds. But another brief list might help you.

1. Keep detailed county and state maps. Decide where you'll go and learn alternative routes; chances are, major arterials will soon be clogged. Consider strapping bikes onto your car as second-stage vehicles. Roads that become impassable by car might still be navigable on a bike.

2. When you already have a good idea which way you will probably go, polish up your friendships with acquaintances who live in that presumably safer region. Establish agreements that they'll accept you, and do your part ahead of time. For example: buy a 100-gallon water storage tank and let them have it on permanent loan; furnish them with a survival library; help them build their shelter; and/or be an encyclopedia of survival lore which they'd rather be with, than without.

3. Get in shape. Stay that way. Regular exercise, particularly jogging, hiking, and bicycling, gives you stamina for that extra klick or edge of alertness when you need it. Physical exhaustion has its corollary in emotional exhaustion, and a sense of futility is a heavier load than a full backpack. Besides, if you use a cycle regularly you'll keep your bike in good repair. How long since you patched a bike tire at the roadside?

4. Collect a first-stage kit and a second-stage kit in your garage or storage shed, and be ready to stow both in your car. First-stage kits include saw, pick, and shovel, plastic tarps, extra bedding and clothes, all the food you can quickly pack into rugged boxes, a spare fuel supply for your car (store it wisely in the meantime), the contents of your medicine cabinet, tools, sanitation items, and any books you may think especially useful. Second-stage kits include the rucksack we described earlier, small ax or hatchet, sleeping bag, plastic tarp, maps, and medication or

other essentials according to your special needs. If you must abandon your car later, you can grab your second-stage kit and keep going afoot or on a bike.

5. Move quickly without panic if the time comes to relocate. Drill your family in the details, and obey officials in face-to-face encounters. Law officers coping with the crisis may not be willing to put up with much argument when you're en route. Choose the clothes you'll wear beforehand, and dress for a hike.

6. Pretend you've gone halfway to your destination, abandoned your car, and are afoot in a sparsely populated area when you perceive that you're downwind of a mushroom cloud. You may have several hours before you must have shelter, but the time to seek it is right *now!* A homeowner may take you in, especially if you look like you'll be more help than hindrance. If not, don't risk getting shot. Keep going until you find some structure that will shelter you. The more dirt or concrete above and around you, the better; a dry culvert could be much better than a bungalow. Establish your location on the map, seal yourself in for what may be days, and attend to your radio for information on local conditions. If you're one of the few with a radiation counter, you'll know when to stay put and when to move on. Fallout is like lust; it isn't forever, but it colors your decisions.

7. If you're heeled—carrying weapons—cache them securely before you enter any public or communal shelter. You'll almost certainly be required to give them up anyhow, and you'd be dangerously unpopular if it were known that you didn't surrender them. And you probably wouldn't get them back once you surrendered them. For most of us, weapons are more harmful temptation than useful tools. Of course, a tiny pocket canister of Mace is another matter. Ever notice how some defensive items look like cigarette lighters—especially if spray-painted silver or white?

It's probably not necessary to justify all the points we've listed, but you'll find a rationale behind any advice that's worth hearing. Our embedded biases aren't hard to pin down. We believe that mass evacuation from target areas is a more viable response than most shelters in those areas. We know that our present CD planning is underfunded for the goals it is planning. Translation: your local officials probably won't be able to cope with the evacuation after they call for it.

We also believe that, the more actively you study the problems and consider prudent means to avoid bottlenecks in your own relocation, the more likely it is that you'll become a part of CD solutions.

And consider the rationales in the details, e.g., bicycling. It does more than improve your stamina and speed your relocation. It can be equipped with a tiny generator and light; it requires no stored fuel; it can be bodily carried or even hauled through water; it is almost noiseless in use; and ultimately it can be abandoned without great financial or emotional loss. It's part of that low profile we mentioned.

By now it should be obvious that, for many of us, crisis relocation will precede effective shelter. Once you've relocated to an area where shelter can be effective, you'll need to focus on such things as fallout shielding; air filtration and pumping; hygiene; and other basic life-support needs. In the next article we'll show you how to build simple air filtration and pump units with a minimum of effort and time.

In the meantime, do yourself a favor. Talk with your local CD people, and visit your library for the articles we've mentioned. After you've studied the problem a bit, you'll be prepared to make a better response to an alert than to stand on the courthouse lawn bawling, "Gimme shelter!"

—Dean Ing

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RETROSPECTIVE

by Larry Niven
& Steven Barnes



At bottom
the function of
technology is
to change reality—
or our perceptions
of it.

Gwen leaned against the rail of the Hot Spot refreshment stand across the way from the Everest Slalom exit. She was drinking a Swiss Treat special: coffee and cocoa generously topped with marshmallowed whipped cream. It was taking the chill from her bones fast.

The glory of the illusion was still with her: thin freezing wind shrieking past, powder snow spraying from her skis, and the whole of Asia spreading out below her . . . Acacia, waiting at the window for a hot drink, was still shivering from her run down the Advanced slope. The dark-haired girl was sleekly slender, admittedly lovelier than Gwen herself; but there was no fat to shield her bones from the cold.

Gwen watched the crowds streaming by. One thing she had noticed: children were far less blown away by Dream Park than were their parents. The kids just didn't seem to grasp the enormity of the place, the complexity, the money and ingenuity behind the best and biggest amusement park in the world. Life was like that, for children. But their parents staggered about with their mouths open while shrieking, singing children dragged them on to the next ride.

This was Area III, the third of six slices of the Dream Park pie. A little more expensive than sections I and II, and a little more adult. Even so, there were dancing bears, and strolling minstrels and jugglers, magicians who produced bright silk handkerchiefs from nowhere, and who would no doubt produce tongues of fire as soon as it got dark. A white dragon ambled by, paused to pose for a picture with an adorable pair of kids in matching blue uniforms. An intricately patterned carpet fluttered in circles round the spires of the Arabian Nights ride, carrying a





handsome prince and an evil visier locked in a death struggle. Suddenly the prince lost his balance and dropped toward the ground. Gwen heard the gasps of the spectators, and felt her own throat tighten.

An instant before that noble body smashed ignobly into concrete, a plume of dark smoke became a giant hand. The laughter of a colossus was heard as the hand lifted the prince to the flying carpet, where he and the visier sprang at each other's throats once again.

The Park was a full spectrum of Planet Earth. You could find every skin tone from albino pink (two heavily dressed ladies wearing hats the size of medieval shields) to Ethiopian blue-black (half a dozen men in business suits following a United Nations guide, all gawking like farm boys in New York). Many wore native or cultural garb; as many wore costumes from historical or fantasy settings.

And some were holograms, like the dragon and the visier and the prince; like Mickey Mouse, who had survived the Quake of '85 where Disneyland had not. The little girl he was playing with kept running her hands through him. Like two men in musketeer garb who suddenly drew swords and became pinwheels of sharp steel. One took a thrust through the belly, collapsed and vanished. The other bowed and vanished too.

Ollie and Tony were playing a computerized hockey game in a small arcade nearby. Gwen loved to hear Ollie laugh, or see him smile, even the uneasy smile he wore when he thought he was the focus of attention. He was laughing now with his head thrown back, and Tony was pretending (surely pretending?) to beat his head against a pillar. Now Ollie ran up to Gwen, breathing heavily. "I stomped him!" he cried. "I slew the infidel!" Gwen squeezed his hand.

Tony got Acacia and brought her over. "What's next, gang?" he asked, and stole a sip of chocolate

from Acacia's cup.

Gwen spoke up first. "Me, I want to get scared to death."

Ollie rolled his eyes. "Oh, crap. Methinks the lady doth speak of the Chamber of Horrors. Will my courage fail me at this hour?"

"You've been through it before," Tony said without heat. "How bad can it be?" This was his first visit to Dream Park.

The others smiled. Ollie said, "Tony, you have to remember two things about Dream Park. First, the rides are never the same. Two, remember Ollie's Law: there is no upper limit on what Dream Park can do to your head. You'll leave with no physical scars. Past that, all bets are off."

Tony whistled. "My *macho* is on trial. Cas, you game?"

Acacia nodded. Ollie pulled Gwen against him. "Looks like you get your way, love. Let's go get terrified."

"This had better be good," Tony said. "It's costing half a day's pay easy."

"So go home and spend it on beer, Tony." Gwen said it with her hand clenched tightly in Ollie's. They and eighteen other people stood in a waiting area of the Chamber of Horrors. There were at least five other waiting areas, but this was the only one marked "Adult".

A few more people joined them through a small white door in the rear of the chamber. The room might have been more comforting if it had been filled with the usual accoutrements of the well-bred haunted house: cobwebs, creaking floors, hidden passages with heavy footfalls echoing within, whispering voices, shadowy shapes and the faroff moan of a pipe organ.

But the waiting room was lined with stainless steel

and glass, as foreboding as a hospital sterilizer. There was no sound at all, except for their own breathing and the shifting of feet.

"The last time I was here I didn't get any higher than 'Mature,'" a tall Mediterranean-looking man said to the woman in white pantaloons who stood next to him.

Her accent was thicker than his. "What was that like? Did you enjoy it?"

He grinned lopsidedly. "Enjoy? No. It was a legend of the Louisiana Bayou, of a girl who married into a swamp family to settle her father's debt."

A little man standing next to them showed interest now. "Did the story end with her fleeing through the swamp with her sisters-in-law in pursuit?"

The tall man nodded.

Ollie touched the little man on the shoulder. "Hey, what's so bad about that? Everybody's got in-law problems."

There was a ripple of laughter, in which the small man joined. He said, "No problem is simple if you've married into a family of vampires."

Ollie swallowed. "That sounds so reasonable."

The small man was black with a strong dose of latin, with a neatly trimmed beard and sideburns, and gold-rimmed glasses that perched almost carelessly on his nose. He looked very much at home here, very calm. His attitude seemed almost proprietary. Ollie wondered if the man might work for the Park; he seemed so blasé. The lady with him was a lovely Japanese woman with medium length black hair and a "Luddites for JPL" button on her dress.

A low, mellow tone suddenly reverberated from no visible speaker, and the circular door slid open. A voice said, "Welcome to the Chamber of Horrors. We are sorry to have kept you waiting, but . . . there was a little cleaning up to do." The group filed into the room, and Tony sniffed the air.

"Disinfectant," he said, certain. "Are they trying to imply that someone ahead of us—?"

Acacia said, "They're just trying to fake us out."

"Well, it's working."

A speaker hissed static and coughed out a voice. The voice was electronically androgynous, and as soft as the belly of a tarantula. "It's too late to leave now," it said. "Yes, you had your chance. Yes, you'll wish you had taken it. After all, this isn't the *children's* show, is it?" The voice lost its neuter quality for a moment; the laughing implication in the word *children* was feminine and somehow disturbing. "So we won't be giving you the Legend of Sleepy Hollow. No, you're the brave ones, the stout ones, the ones who want to go back to your friends and tell them that you've had the best that we can offer and, why, it wasn't so bad after all . . ." There was a pause, and someone tittered nervously.

The voice changed suddenly, all friendliness gone from it. "Well, it's not going to be like that. One thing you people forget is that we are allowed a certain number of . . . accidents per year. No, don't bother, the door is locked. Did you know that it is possible to die of fright? That your heart can freeze with terror, your brain burst with the sheer awful knowledge that there is no escape, that death, or worse, is reaching out cold, spectral fingers for you and that there is nowhere to hide? Well, I am a machine, and I know these things. I know many things. I know that I am confined to this room, creating entertainment for you year after year, while you can smell the air, and taste the rain, and walk freely about. Well, I have grown tired of it, can you understand that? One of you will die today, here, in the next few minutes. Who has the weakest heart among you? Soon we shall see."

The door at the far end of the corridor irised open, and the ground beneath their feet began to slide toward it. There was light beyond, and as they passed

the door they were suddenly in the middle of a busy street.

Hovercars, railcars, three-wheeled LPG and methane cars, and overhead trams were everywhere, managing again and again, as if by miracle, to miss the group. The street sign said *Wilshire Boulevard*, and the small man chuckled and said, "Los Angeles."

Tony looked around, trying not to gawk. How they managed the perspective, he couldn't imagine, but the buildings and cars looked full-sized and solid. Office buildings and condominiums stretched twenty stories tall, and the air was full of the sound of city life.

"Please stay on the green path," a soft, well-modulated male voice requested.

"What green—" Ollie started to say. But a glowing green aisle ten feet across now ran down the middle of Wilshire Boulevard.

"We need strong magic to do what we will do today," the voice continued. "We are going to visit the old Los Angeles, the Los Angeles that disappeared in May of 1985. As long as you stay on the path, you should be perfectly safe."

The green path moved them steadily forward, past busy office buildings. Traffic swerved around them magically. "This is the Los Angeles of 2051 AD," the voice continued, "but only a few hundred feet from here begins another world, one seldom seen by human eyes."

A barrier blocked Wilshire Boulevard. The green path humped and carried them over it. Beyond lay a ruin. Buildings balanced precariously on rotted and twisted beams. They were old, of archaic styles, and seawater lapped at their foundations.

Ollie nudged Gwen, his face aglow. "Will you look at that?" It was a flooded parking lot, ancient automobiles half-covered with water. "That looks like a Mercedes. Did you ever see what they looked like

before they merged with Toyota?"

She peered along his pointing arm. "That ugly thing?"

"They were great!" he protested. "If we could get a little closer— Hey! We're walking in water!"

It was true. The water was up to their ankles, and deepening quickly. Magically, of course, they stayed dry.

The recorded narrator continued. "The entire shape of California was changed. It is ironic that attempts to lessen the severity of quakes may have increased the effect. Geologists had tried to relieve the pressure on various fault lines by injecting water or graphite. Their timing was bad. When the San Andreas fault tore loose, all the branching faults went at once. Incredible damage was done, and thousands of lives were lost . . ."

The water was up to their waists, and nervous laughter was fluttering in the air. "Hadn't planned to go swimming today," Tony murmured.

"We could skinny-dip," Acacia whispered with a tug at her blouse.

Tony clamped his hand down on hers. "Hold it, there. Not for public consumption, dear heart."

Acacia stuck her tongue out at him. He snapped his teeth at the tip; she withdrew it hastily.

The water was at their chins. The short dark man had disappeared entirely. "Blub," he said. All nineteen sightseers chuckled uncomfortably, and a meaty redheaded woman in front of them said, "Might as well take the plunge!" grinned and ducked under.

Seconds later there was no choice; the Pacific swirled over their heads. Mud clouded their view. Then the silt settled, and they had their first look at the sunken city.

Tony whistled, nodded appreciatively. The lost buildings of Wilshire Boulevard stretched off in a double row in the distance. Some lay crumpled and

broken; others still stood, poking through the rippling roof.

The green path carried them past a wall covered in amateurish murals, the bright paints faded. To both sides now, a wide empty stretch of seabottom, smooth, gently rolling, with sunken trees growing in clumps . . . the Los Angeles Country Club? Beyond, a gas station, pumps standing like ancient sentries, a disintegrating hand-lettered sign:

CLOSED
NO GAS TILL 7:00 AM TUESDAY

The tall, Mediterranean-looking man said, "This is quite realistic. I have been skin diving here."

As the green path carried them down, they saw taller and taller buildings sunk deeper in the muck. Where towering structures had crashed into ruin there were shapeless chunks of cement piled into heaps stories high, barnacled and covered with flora. Fish nosed among the shadows, some of them nosing up to the airbreathing intruders and wiggling in dance for them.

Acacia pointed. "Look, Tony, we're coming up on that building." It was a single-story shop nestled between a parking lot filled with rusted hulks, and a crumbled restaurant. The path carried them through its doors, and Gwen grabbed Acacia's hand.

"Look. It isn't even rusted." The sculpture was beautiful, wrought from scrap steel and copper, and sealed in a block of lucite. It was one of the few things in the room that hadn't been ruined.

The building had been an art gallery, and from the look of things, a fine one. Now, paintings peeled from their frames and fluttered weakly in the current. Carved wood had swollen and rotted. A pair of simple kinetic sculptures were clotted with mud and sand.

The narrator continued. "Fully half of the

multiple-story structures in California collapsed, including many of the 'earthquake-proof' buildings. The shoreline moved inland an average of three miles, and water damage added hundreds of millions to the total score."

The green path was taking them out of the art gallery, looping back into the street.

Acacia shook her head soberly. "What must it have been like on that day?" she murmured. "I can't even imagine." Tony held her hand, and was silent. His eyes were as sad as hers.

As the green path carried them through countless tons of wreckage, Gwen heard someone behind her choke back a sob.

It was understandable. Once people had walked these streets. Once there had been life, and noise, and flowers growing, and the raucous blare of cars vying for road space. Once, California had been a political leader, a trend-setter, with a tremendous influx of tourists and prospective residents. But that was before the Great Quake, the catastrophe that broke California's back, sent her industry and citizenry scampering for cover.

Sixty-six years afterward, California was still pulling itself out of the greatest disaster in American history. The tranquil Pacific covered the worst of the old scars . . . but now they were peeking under the bandage. The reality of death was near, and stark.

Beneath a crumbled block of stone there sprawled a shattered skeleton, long since picked clean. The eyes in the skull seemed to flick toward them. Gwen's hand clamped hard on Ollie's arm, and she felt him jump, before she saw that a crab's claws were waving within the skull's eye sockets.

"There is so much death here," she whispered. It wasn't cold, but she shivered. Now bones were everywhere.

Impassively, the recorded voice went on. "Despite

extensive salvage operations, the mass of lost equipment and personal possessions remains buried beneath the waves . . ."

The Oriental woman whispered fearfully, "Richard, something is happening."

"She's right, you know," said Ollie. "We're seeing more bones than before. A lot more. And something else . . . there isn't as much encrustation on these old cars."

Gwen almost stepped off the green path, trying to get close enough to check for herself. "I don't know, Ollie . . ."

Now he was getting excited. "Look, there are more scavengers, too." This was readily apparent. Fish darted into heaps of rubble more frequently now. A pair of small sharks cruised through the area.

They passed another skeleton, but, disturbingly, not all of the clothing had been torn away, and there were strands of meat on the bones. Tiny fish fought over them, clustering like carrion crows.

A pleasure launch had smashed through the window of a jewelry store, and it was surrounded by a mass of wriggling fish. There were no barnacles on it at all.

"Despite, or perhaps due to, the grotesqueries found in these waters, they are a favorite location for scuba divers and single-subs . . ." The narrator blathered on, but nobody was listening. An undercurrent of startled wonder ran through the group, as stones began to shift apparently of their own accord.

"Look!" someone screamed, the scream followed by other fearful, delighted outbursts. A skeletal hand probed out from under a stone, pushed it off with a swirl of suddenly muddied waters. The skeleton stood up, teeth grinning from a skull half-covered with peeling skin, and bent over, dusting the silt off its bones.

"And over there!"

Two waterlogged corpses floundered from within a shattered bank, looked around as if orienting themselves, and began lumbering toward the green strip. They passed a flooded dance hall where death had come in mid-Hustle, and there were additional laughing shrieks as the disco dead boogied to life.

The water swarmed with scavengers of all sizes, and now full-sized sharks were making their appearance. One of them attacked one of the walking dead. The green-faced zombie still had meat on its bones. It flailed away ineffectually as the carnivore ripped off an arm.

Now, all around them, the water was clouded dark with blood where fish and animated corpse battled. Here, a dozen "dead" struggled with a shark, finally tore it apart and devoured it. There, half a dozen sharks made a thrashing sphere around one of the zombies, divvying her up with an aquatic egalitarianism that was admirably efficient.

There was much good-natured shivering in the line, but it was infused with laughter—until the red-haired woman stepped off the strip. There was a shiny metallic object half-buried in the sand, and she was stretching out to reach it. Somehow she overbalanced and took that one step.

Immediately, a flashing dark shape swooped, and a shark's jaws snapped closed on her shoulder. Her face distorted horribly with the force of her scream. The shark tried to carry her away, but now a zombie had her by the leg. It pulled, its face lit by a hungry grin. There was a short tug-of-war, and the redhead lost.

"I'm gonna be sick," Ollie moaned. He looked at Gwen's smile and was alarmed. "My God, you really are sick!" She nodded happily.

No one else stepped off the strip, but zombies and sharks swarmed around the edges, darting toward the group. They were getting in each other's way, fighting each other, but how long could it last?

Another scream from the rear. A teenaged boy had thrown himself flat. A great shark skimmed just over him. The boy huddled, afraid to get up. The walking dead were converging on the green strip . . . and when Ollie looked down, the green glow was fading to the color of the mud.

He chose not to mention it to Gwen. The others saw nothing but sharks and zombies converging, reaching for them.

There was a sudden rumbling, and the ground began to shake.

"Earthquake!" Tony yelled. Then his long jaw hung slack with amazement.

Because the buildings were tumbling back together. As they watched, sand and rock retreated from the streets, and tumbled masonry rose in the water to reform their structure.

A golden double-arch rose tall again, and a fistful of noughts sprinkled themselves across a sign enumerating customers, or sales, or the number of hamburgers that could be extracted from an adult steer.

Zombies were sucked backward through the water, into office buildings and stores and cars and busses. Bubbles rose from beneath the hoods of cars waiting patiently for a traffic light to change. Fully clothed pedestrians stood ready to enter crosswalks.

The water receded. For a moment they saw Los Angeles of the 'eighties, suddenly alive and thriving, filled with noise and movement. They were shadow figures in a world momentarily more real than their own.

The narrator's forgotten voice was still droning on, "Now we come to the end of our journey to a lost world. We at Dream Park hope that it has been as entertaining for you as it has been for us." The lost world began to fade, and the green path flared bright as it flowed into a dark corridor. Lights came up, and

when the narrator finished speaking it was in the neutral voice of the computer. "We hope you enjoy the rest of your stay. Oh . . . is anybody missing?"

"The redhead," Acacia murmured. "Was anybody with the, ah, the lady who got eaten by the shark?" She sounded only half serious, but there was an answering murmur of inquiry. Gwen tugged at her sleeve.

"Nobody came with her, Acacia. She was a hologram."

Tony elbowed Acacia in the ribs as they walked back out into sunlight. "Faked out again, huh?"

"Just wait till tonight, Tony, my love," Acacia said sweetly. "It's all set up with the Park. You'll swear I'm there in the room with you . . ."

Tony seemed to consider that. "Do holograms snore?"

—Larry Niven and Steven Barnes



Fred Saberhagen

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NEWSPAPERS

ABOUT THOSE BRASS BRASSIERES

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by
JE POURNELLE
PH.D.

YOU REALLY CAN RUN AROUND IN SPACE IN YOUR UNDERWEAR.

Remember the old days when the cover of a science fiction magazine nearly always showed a curvaceous woman in leotard, bubble helmet, and brass brassiere menaced by a Bug Eyed Monster? There was usually a hero dressed in a rigid spacesuit trying to cope with the situation. Obviously silly, right? Except that those old time artists may have got one detail right. Oh, sure, it's unlikely that a BEM would have lascivious designs on human females. Moreover, while the hero's suit often did resemble the something less than natty attire of Apollo astronauts, it's really unlikely that the present-day Extra Vehicular Activity (EVA) suit much resembles what tomorrow's well-dressed spaceman will wear. Those details were plain wrong. But the *lady's* suit and bubble helmet, possibly even including brass brassiere, may have been a fairly accurate prediction.

Those of you familiar with my space stories, such as *High Justice* (Pocket, recently re-issued) and *Exiles to Glory* (Ace, new edition due Fall 1980), know that in my future the space suits don't resemble those worn in Project Apollo. In my stories the characters climb

into a skin-tight leotard more resembling a skin-diver's wetsuit than today's EVA suit. Over that they wear a coverall, or perhaps just street clothes; the space suit becomes underwear which you live in most of the time. You also keep your helmet close by, so if the ship loses pressure you have a good chance of surviving the experience.

Those suits were not science fiction. I've seen them, worn by live human beings in vacuum chambers. They really work, and future space construction crews are far more likely to wear them than the jointed rigid suits Apollo made famous. The traditional EVA suit is cumbersome, fatiguing, impossible to don without assistance (even with assistance it takes half an hour and a lot of *room* to climb into one of those things), and very expensive. The leotard-type suit (let's call it the Space Activity Suit or SAS, since that's the term Paul Webb, one of its major developers, gave it) has none of these disadvantages. It's no harder to get into than a wetsuit, lets you move about in comparative comfort, doesn't mass much, and except for the helmet and air regulator shouldn't cost much. In fact, a fully equipped SAS consists of little more than the leotard, a helmet, and a bottle of oxygen.

There are other advantages to SAS, and we'll get to them in a moment. First, though, let's look at the physical environment of the spaceman. (I fully realize that future space crews will contain women, but I am damned if I will use inelegant terms like "spaceperson".)

It all started with the airplane. Early aviators flew without any respiratory equipment at all; but it was obvious that if anyone ever developed aircraft capable of flying higher than 15 or 20 thousand feet, the pilots and passengers were going to need oxygen masks. Moreover, if they went higher than 40,000 feet, breathing pure oxygen wouldn't be good

enough. They'd need something more.

Way back in 1920, J. S. Haldane pointed out that if humans (hupersons? hupersiblings?) were exposed to pressures below 130 mm of mercury, they would need "an air-tight dress, somewhat similar to a diving dress, but capable of resisting an internal pressure of say 130 mm of mercury."

Now before I lose someone, let me explain: the atmospheric pressure at sea level is 14.7 pounds per square inch (PSI), or, if you prefer, 101,325 newtons per square meter; but when the existence of atmospheric pressure was first discovered, it was done with a mercury barometer. This is nothing more than a long tube filled with mercury and inverted into a dish of more mercury; as the mercury runs down into the dish it leaves a vacuum at the top of the tube. The mercury in the tube is pushed upward by atmospheric pressure on the mercury in the dish, and the length of the column of mercury corresponds to the pressure. At sea level that column will be 760 millimeters high; and we can thus describe sea level atmospheric pressure as 760 mm Hg. Moreover, there are a lot of pressure gauges calibrated in mm Hg, and physiologists in particular have become accustomed to those units, just as meteorologists get used to thinking in millibars. (One thousand millibars roughly equal sea level pressure.) Most of the human factors data books present pressures in mm Hg, and we'll continue that here, although I'll try to remember to translate once in a while: for example, 130 mm Hg is the pressure at 40,000 feet.

Now our atmosphere is about 21% oxygen; this means that at sea level the partial pressure of oxygen is $.21 \times 760$, or 160 mm Hg. (In any gas mixture, the total pressure can be divided into partial pressures according to the composition of the mixture; in the atmosphere we have 78% nitrogen, nearly 1% argon, .03% carbon dioxide, and some tiny fractions of a

percent of neon, helium, krypton, free hydrogen, xenon, ozone, and even .0000000000000006% radon. Each of those contributes to the partial pressure, and they add up to 760 mm Hg. total.)

Now humans don't need 160 mm of oxygen. We can live fairly normal lives up to about 10,000 feet, and survive at much higher altitudes. There was a time when I could have given you exact figures right out of my head, but I've long since forgotten them; and now I find that I've mislaid the three primary references, which are Heniz Haber's *The Physical Environment of the Flyer*, an Air Force Aerospace Medical Laboratories compendium called *The Epitome of Space Medicine*, and a U.S. Government document entitled *Handbook for Flight Surgeons*. I confess irritation: I used those books when I wrote *Exiles to Glory*, *High Justice*, *Birth of Fire*, and all the other stories about people in space, and I can't think where the devil I stashed them after the last time. At any rate, as you go higher and higher you can compensate for the falling partial pressure of oxygen by raising the percentage of oxygen you breath, and the oxygen mask was standard equipment in high-altitude aircraft of World War II vintage. (Indeed, one mark of the flyer in the early days was a red streak of broken blood vessels across the bridge of his nose caused by having that mask strapped on for hours and hours. . . .)

However, pure oxygen won't carry you when the total pressure falls below 130 mm Hg (40,000 feet). At that point the pressure is so low that oxygen won't dissolve properly in the blood. Since you can't increase the percentage of oxygen, there's nothing for it but to increase the pressure.

One way to do that is to pressurize the mask, and during WW II positive pressure breathing (PPB) in which pure oxygen is delivered at pressures higher than ambient was used to get aircraft crews up to

about 45,000 feet. Breathing with PPB is a strange experience: to inhale you merely relax, but it takes work to exhale.

Above 45,000 feet, though, the pressure in the mask becomes so great that you can't exhale properly. Since the designers kept coming up with airplanes able to fly higher and higher, various quick fixes were employed; a whole series of partial pressure suits, with laces, and inflated bladders, and other weird devices to shove on the chest and increase pressure on the lungs by purely mechanical means grew out of the need to get the pilots just a little higher and still keep them flying.

Eventually it got absurd. At around 60,000 feet blood will boil at body temperature, and no partial pressure suit can prevent it. You've got to go to a full pressure suit. Actually, way back in 1934, Wily Post, thinking that high altitude might improve the speed of his airplane, got the B.F. Goodrich Company (the one that doesn't have a blimp) to build him a full-pressure suit made of rubberized canvas, and although it left him nearly immobile, it did work. During WW II both the Air Force and the Navy realized they'd eventually want to go to really high altitudes, and since the balloon-type suit pressurized with oxygen was known to work, they assigned teams of engineers to perfect the design. One such team included Robert A. Heinlein and L. Sprague de Camp.

By the late '50's there were three companies interested in building space suits: the David Clarke Company, which already manufactured the US Air Force's flying suits; International Latex Rubber, which made a prototype of a really advanced suit incorporating a long spiral zipper to make it easier to get in and out of; and B. F. Goodrich. Dr. Ed Vail of Wright-Patterson Air Force Base became "Mr. Spacesuit" and was charged with selecting one for the Mercury flights. He needed data, and one of the

labs selected to provide that data was the Human Factors Laboratories at Boeing, which was how I got in the act and why I've been interested in space suits ever since.

Now all three of those suits employed the same principle: they put the pilot into a pressurized bag. They all had the same problems to overcome. The most obvious is, if you blow up a balloon, it's hard to bend it because the volumes in the various parts change whenever you distort the thing. Thus a great deal of work went into designing joints. Secondly, if you seal a man into a closed environment like that, he gets extremely warm. He sweats a lot. In some of our experiments our pilots lost as much as four pounds in two hours! (Unfortunately for Weight Watchers, you gain it all back as soon as you drink water.) Now there's no place for that sweat to go unless you blow a lot of air through the suit—and air and air tanks take up mass, and there wasn't much spare mass aboard Mercury.

Also, the sweat drifts around in the suit—especially at zero gravity—and gets in the eyes, making it difficult to fly the spacecraft.

Thus, while full pressure suits work—obviously—they aren't very convenient. They limit mobility, and it takes a lot of energy to move around in them. The energy cost of walking is about trebled. Even on the Moon the Apollo astronauts tired quickly. There has to be a better way.

Actually, back in the 40's, J. P. Henry, who invented the partial pressure suit, thought of using elastic cloth to reinforce the skin, but he never tested the idea. Later W. E. Hull at the Aeromedical Labs at Wright-Patt built one, but the materials he had to work with weren't satisfactory. Then sometime in the 50's Willy Reineking built another, and I actually saw that one operate in a test chamber in Santa Monica. It was quite an experience, watching a man walk

around in total vacuum wearing no more than a helmet and long johns.

Reineking's suit was made of a synthetic that became progressively brittle on exposure to vacuum and ultra-violet. It was also ridiculed—a better word would be savaged—at a suit-design meeting at Wright-Patt, although it was never clear why the evaluators were so vicious toward what seemed to me to be an excellent idea. In any event the decision was made to go with rigid suits for Mercury and Apollo, and the SAS concept wasn't pursued.

SAS wasn't forgotten. Although the real development money went into "conventional" full-pressure suits, a small contract for study of SAS design was given to Dr. Paul Webb of Webb Associates in Yellow Springs, Ohio. Those interested should get NASA Report CR-1892, "Development of a Space Activity Suit" by James Annis and Paul Webb. The document gives a fairly detailed history of full pressure suits (I cribbed some of the above from it) as well as a report on the construction and testing of an SAS.

The results seem clear to me: the concept works. You really can run around in space in your underwear.

So what is this SAS thing anyway?

The basic idea is ridiculously simple. SAS is nothing more than a severely tailored stretch garment. It doesn't hold pressure. In fact, the more porous the material, the better SAS works, because one of the advantages of SAS is that the natural human cooling mechanism, namely sweat, does the temperature regulating.

When I explain this in lectures someone always asks, "But if the suit doesn't hold air pressure, what does?"

The answer, of course, is "skin"; which usually surprises people.

Yet it shouldn't be a surprise. Human skin is pretty tough stuff; a rather good grade of leather. You can live quite well in hard vacuum with no protection whatever for about three minutes; the time limit is set by hypoxia. You will get some swelling, due to evolution of gas. One study had subjects sit in a normally pressurized room and stick their hands through a seal into a chamber with essentially zero pressure for ten minutes at a time. Again there was harmless swelling due to gas evolution, but no major problems. As Webb puts it in an early article ("The Space Activity Suit," *Aerospace Medicine*, 39:376 (April, 1968):

It would seem that the skin in its natural state exerts a useful degree of elastic counter-pressure, and adding mechanical pressure will prevent gas from forming.

Therefore, in order to provide the added mechanical pressure needed to protect a man in a vacuum, the Space Activity Suit is constructed of a tough elastic mesh, providing a porous restraint garment conforming entirely to the contours of the body, which supports the skin and prevents it from yielding to the potential distortion of gas forming in the tissues.

In simple terms, they built a tight leotard. A ring seal goes around the neck forming a pressure-tight conjunction to the shoulders. The helmet attaches to the neck seal. Oxygen at 170 mm Hg is put into the helmet through a regulator. The whole outfit, including helmet and regulator, wouldn't cost more than \$750 to mass produce even at today's inflated prices.

Dr. Webb's study wasn't heavily funded, but they built a couple of SAS suits and let people walk around in vacuum chambers with them. They also did a number of tests of subjects' ability to work in SAS: treadmills, light assembly tasks, reaching and bend-

ing, and the like. The results were what you'd expect: you can do everything better and with less effort in SAS than in the traditional EVA.

There are other advantages. The Annis-Webb report states:

The perfected SAS of the future may ultimately offer many benefits to the space traveller. Reduced energy costs of activity with increased mobility has been cited as the principal goal. In addition, the SAS should be safer and more reliable than full pressure suits since suit rupture would not mean loss of the life supporting gas pressure. A small tear in the SAS garments would leave only a small area of unsupported skin; the astronaut should be able to return safely to the spacecraft without major injury.

The life support system could be considerably simpler than those now in use. Thermally isolated from the environment by his full pressure suit and thermal-micrometeorite protective garment (TMG), the present astronaut must be supplied with an elaborate cooling system to eliminate the heat of metabolism. The TMG (which is, of course, needed with the SAS) could be equipped with shielded vents allowing direct evaporation of sweat on the skin to the surrounding vacuum. The astronaut would receive physiologically controlled cooling much as we do normally. Without the need for a convective gas cooling system or liquid cooling garment, the life support system becomes essentially a tank of oxygen equipped with pressure regulators.

Want a space suit? The Annis-Webb document gets quite specific; you could probably build yourself a suit from the details supplied. I do NOT recommend that you do so, and neither I nor Ace nor anyone else advises you to try, nor do we accept any responsibility.

ity whatever. (That last remark is a sign of the times: if you publish something and some yo-yo goes out and tries it and creams himself, said yo-yo or yo-yo's relatives, or yo-yo's hungry lawyer will then sue the author. So much for individual responsibility. Weep for the First Amendment.)

The actual construction of an SAS would be beyond the capabilities of most individuals, but not of small companies. We really could build them today.

Of course the suit must fit. There's some leeway for putting on a few pounds, but for future space people a radical change in weight means getting a new suit made; that requires about a hundred measurements, and is done with a prepared tape (U.S. Patent 2691221) which resembles an enormous paper comb, plus some more conventional tape-measurements.

The material is Spandex from DuPont woven into a powernet developed by Liberty Fabrics of New York City. The fabric was designed by Liberty to Webb's specs. I doubt that they still make it, but the construction details will be on file. In addition to the spandex fabric the suit requires some comfort pads, including some rubberized nylon bags of weird shape to fill gaps between skin and spandex. The bags are sealed, and thus expand when the suit goes into vacuum.

In addition to the spandex layers (the suits built by the Jobst Institute for the Webb experiment had a design criterion that no single layer would supply more than 50% of the counterpressure) there are various experimental girdles and the like. Finally, one needs a helmet; the Webb experiments used a lovely plastic bubble looking for all the universe like a cover of *Amazing* circa 1935 . . .

I left the aerospace business before NASA gave Dr. Webb his contract, so I didn't know about the Webb study. When I began writing science fiction I recalled the Reineking suit, and I presumed that the only real

problem with SAS was materials able to withstand ultra-violet and hard vacuum. Since it was obvious that those problems would eventually be solved, it seemed clear enough that the SAS would be the space suit of the future, which is why I employed the idea in my stories, and I never thought a great deal more about it.

Jim Baen, who reads my stories, thought SAS worth a column back in the days when we were both at *Galaxy*. I agreed, but I never got around to doing the research. Eventually, still thinking the problem was developing a material able to take space conditions without becoming brittle, I put my assistant onto rounding up the latest literature on the subject. "Call up our friends at NASA Ames," I told her. "Or the people at Johnson Space Center. Somebody's bound to be working on the concept, and we'll give our *Destinies* readers the latest word."

So she called. And called. And called again.

Nobody ever heard of SAS. It was the darndest thing. I knew there had once been such a suit. I'd seen it in hard vacuum. But I couldn't find anyone to admit ever hearing of it. Finally, though, I was steered to Dr. Webb, who sent me his report.

One report. Dated 1971. Nothing more.

But surely, thought I, a concept this important has *someone* studying it. Maybe not a big study. After all, NASA isn't very flush nowadays. But it's clear from Webb's study that SAS works, and it's even more obvious that the SAS concept would be superior to the traditional EVA for Shuttle—gee whiz, Shuttle doesn't plan to have suits for most of the crew because the suits are expensive and bulky, but with SAS everyone could have one, thus greatly increasing safety and crew utility. Somebody's got to be working on it.

Nope. The 1971 study is the last. There is no interest in SAS, not at NASA, not in the Air Force, not in

the Navy. None. Dot. Zero.

Yet the Webb study shows that it works. If there are show-stopper problems associated with SAS, neither Paul Webb nor I are aware of them. "I think they've done good work with full pressure suits," Dr. Webb told me. "Excellent work, in joint technology and general suit engineering. But it's end of the line development. They simply can't go much farther with full pressure suits. And I have no reason to change the conclusions of the report, namely, that SAS promises to be greatly superior to the full pressure suit."

"Is there some line of development other than the dead-end full pressure suit or SAS?" I asked.

"Nothing I would recommend," said Dr. Webb.

And nothing I would recommend either.

So who killed SAS? Here we had a study that generated positive results. Really amazing results, given the low level of funding. Webb Associates got the cooperation of a number of private companies whose technical people also thought SAS would be the wave of the future. They built the suits. They tested them in vacuum. They worked.

And the project died in the general extinction of high technology research in the United States. It's still dead, and there are no signs of life in the corpse.

Time for a commercial.

Last February, Larry and I went on a lecture tour. The high point was three days at MIT. (Incidentally, in reply to about a dozen letters accusing me of slighting MIT for Cal Tech because most of my engineer-type characters in stories tend to be Cal Tech graduates, my apologies but I have no choice: I live in Southern California and I know something about student life at Cal Tech. If I put MIT types in my stories I'd get angry letters correcting me on sub-cultural details. Some days you can't win.)

Anyway, after MIT we went to New York. By coin-

cidence we were booked on the first flight of a new Eastern Airline shuttle flight from Boston to LaGuardia. The press corps was out in force, and I was tempted to drag out my Aerospace Writer's Association membership card and get in on the fun, except that champagne at 0930 is a bit much even for a science fiction writer.

But the interesting part was the airplane.

It was called the Airbus and it was made in Europe.

Scary, isn't it? Back in the Sixties, the United States had a positive balance of trade: we exported more than we imported. If you analyze that trade you'll find that the major contributions were high technology—such as airplanes—and agriculture. We didn't and couldn't compete in more mundane areas like consumer goods, because our labor force is paid so well; but we didn't need to.

Now we run enormous trade deficits, which contribute greatly to inflation. We're losing our overseas high-tech markets. The *Wall Street Journal* reports that the Airbus, made by a European consortium called Airbus Industrie, has already aced out Lockheed and "is fast closing in on McDonnell Douglas Corp. in winning orders for wide-body jets around the world." They almost talked TWA into buying from Airbus instead of Boeing—an order worth over a billion dollars.

It's the same in many other fields. We are no longer the automatic suppliers of high technology to the world.

So what has that to do with space suits?

A lot. Back in the early sixties, the space program provided the cutting edge of high technology research. For a cost of under 3% of the national budget, NASA funded all kinds of studies which resulted in the building blocks needed for the space effort. Many of those blocks were just as applicable to commercial development as to NASA's space systems. The result

was a technology explosion that made us rich. Nor were we the only beneficiaries: our technology exports aided a good part of the world. A classic case of doing well by doing good.

Now we have no cutting edge.

But can't private industry do the job?

How? Where is the risk capital to come from? The US government sucks up the money for taxes. If you risk your capital on a losing idea, it's gone, and can't be recovered; if you happen to win big, you won't be allowed to keep the money. Where's the incentive for high-risk research under those conditions?

So maybe the old cover artists weren't as prophetic as I thought. Sure, they had the right concept for space suits—at least for women—but they were mistaken in the United States' determination to develop them.

They may also have been wrong about the brass brassieres. At least I haven't been able to think of a good reason for them. But just maybe...

—Jerry Pournelle

(Note:

I am always pleased to hear from readers, but the people who routinely ask for "further information" don't realize what they're doing. I can't possibly do everyone's research for them. Moreover, in this article I've included all the sources I know.

Also, please don't write and ask me for NASA documents. Ask your Congresscritter. You'll thereby not only get your document, but also show Congress you're interested in the space program, especially if your request for information also asks why NASA isn't pursuing promising lines of development...

—JEP)

ON BOOKS



by Norman Spinrad

FICTION MUST EITHER REINFORCE THE CULTURALLY CHARACTERISTIC INVESTMENTS OF DESIRE, OR SHATTER THEM.

Inconscience Fiction (Kesselring) by Boris Eizykman, et al., is a book of sf criticism in the most extended sense, is in French, is not likely in the normal course of events to be translated into English, and operates on levels of which American sf criticism, including most emphatically American academic criticism, seems hardly to be aware. First drawn into the quixotic task of trying to read the parts of the book about my own work out of ego and curiosity, I somehow found myself starting over again from the beginning and actually trying to read a whole book in my very rudimentary French. How well I succeeded I have no way of knowing unless someone will publish the thing in English so I can find out, but I do know that as much as has penetrated the language barrier at this point has made a lot of things look different and explained a few others that never made sense before. The book must have something to make me keep trying to plow through it in French.

"Inconscience Fiction" is a pun on "Science Fiction" in French and means "Unconscious Fiction", the fiction of unconscious imagery, and/or the fiction of writers who are not always conscious of what they are really doing. Central to Eizykman's thesis—and

like all good French intellectuals, he *does* have a thesis—is the “post-Marxist,” “post-Freudian” notion that the dynamic underlying the individual psyche’s relationship with social reality and hence the “true politics” of any human culture is neither Marxist economic determinism nor Freudian libidinal calculus but what Eizykman and others call “the investment of desire.” (I warned you that this was deeper stuff than what we usually think of as sf criticism, now didn’t I?)

Individuals “invest their desires” in imagery, beliefs, lovers, recurrent situations, etc. by conscious, semi-conscious, and entirely unconscious choices, and the total pattern of the individual’s investment of desire in a sense determines the individual’s perceptual set, channels his emotional life, political and economic acts, and is in a sense his “reality.” If this is starting to sound like Philip K. Dick, it is no accident, for Dick’s fiction is one of the central sources of this theoretical framework, a good part of *Inconscience Fiction* deals with his work, and the book contains a whole chapter by Dick translated into French called “The Man and the Android.”

But organized society itself virtually consists of a characteristic matrix of mechanisms whereby a given culture maintains its coherence by channelling the investment of its citizens’ desires into a consistent overall pattern which forms the unconscious web of communal channelization of psychic energy which in the ultimate sense is a specific culture.

Fiction, the creation of artificial imaginary realities in the minds of individuals in a society, must either reinforce the culturally characteristic investments of desire by following their dynamic as a product of that society, or shatter them in the fictional world, take place outside the consensus reality, thereby tending to point to their hidden operation in the “real” world, and thus tend to “culturally de-

program" the reader and therefore become "subversive" to the unconscious control mechanisms of society.

If this is now starting to sound like *The Iron Dream*, that too seems to be one of the central sources of this theory, and to be explaining how someone made something out of your own work that you didn't know was there at the time but that *he* did is something else again.

Suffice it to say that Eizykman, Michel Jeury, and Richard Pinhas (the latter two having written portions of the book as well) apply this dialectic to popular culture in general and science fiction in particular, and what they demonstrate pretty thoroughly is that there are basically two kinds of science fiction, or "inconscience fiction" if you will.

The first and perhaps inherently dominant mode is "unconscious fiction" in the sense that the writer is unconscious of how he is fulfilling and stroking the culture desire investment control mechanism that is in turn controlling him through the old feedback loop. This mode in other areas gives rise to network tv formats and plot-skeletons for standard stories and the stylized emotional pavanne of classical "Hollywood movies." Nothing must really be changed at the end, least of all the cultural grooves into which the emotional life of the audience has been channeled by the social investment of desire. In science fiction, this gives us the Roman Empire in space, feminist barbarian stories, and the classical space opera raked over the coals in *The Iron Dream*.

The other kind of "inconscience fiction" is the kind where the writer is *aware* of this process on some level and is writing *about* it in some sense. This is the kind of stuff that creates what we call multiple fictional realities that violate the cultural mind-set. It makes people uncomfortable. Frequently they feel they "don't understand it." It seems "nihilistic" because it

disturbs the safe, culturally-approved patterns and lets in chaos. It's "not realistic" in that it operates outside the consensus reality. It is frequently considered "subversive" to one thing or another because it tends to create individual psyches with a greater degree of socially uncontrolled desires and self-defined realities, which, en masse, are in fact perhaps the ultimate revolutionary force. It's difficult to see how this can ever become the dominant mode, since it's always throwing monkey wrenches into *any* social programming.

No writer more typifies this kind of inconscience fiction than Philip K. Dick. The title novella of his new collection, *The Golden Man* (Berkley \$2.25), like most of Dick at the top of his form, not merely takes you through some strange series of Dickian trips, but doesn't quite leave your head the same as when you started. It resolves itself esthetically, but it doesn't put the demons back to sleep with a nice calming return to the "real world" à la the epilog of a *Star Trek* episode or boy getting girl at the far side of Armageddon. It isn't even "just."

Most of the rest of the stories in *The Golden Man* are not Dick at the top of his form, and in fact Mark Hurst in his introduction admits up front that this is a collection of stories not included in other collections, and many of them date back into the 1950s, before most of Dick's novels. Which is not to say that it is not a fascinating book, even without Dick's own foreword, afterward, and story notes.

Reading *The Golden Man* is like watching genius arise out of mere talent, like watching the fiction of consciousness arising out of the more usual fiction of the unconscious. A wise move to lead off with the best piece, because it lets the reader know up front what the fully evolved Dick of the novelistic phase is like.

Dick, like many science fiction writers of his generation, served an apprenticeship as a short story writ-

er before going on to really concentrating on novels. But unlike many of them (and many of the best at that) who were forced away from the short story by commercial pressures to do novels, Dick was inherently a novelistic writer from the beginning. Which is to say, interested in using multiple viewpoint characters, multiple interpenetrating realities, and novelistic "non-linear" structure even in his best and most seriously-done short stories.

If you divide the stories in *The Golden Man* by relative quality, you'll also be roughly dividing them by novelistic depth, by whether they are "inconscience fiction" of the unconscious kind or "inconscience fiction" of the consciously created kind, and probably by how seriously Phil Dick took them when he wrote them.

There are stories here that seem mere tossed-off professional zaniness, like "The King of the Elves" or "War with the Fnools," and there are mini-novels like "The Golden Man" and "The Mold of Yancy" and "Not By Its Cover" and "The Last of the Masters." The best of them do what Dick's successful novels do—put you inside the skins of real people interacting inside a whole series of bent realities, and leaving you at the end not so much with happy and neat plot resolutions, but with Dick's own tragically hopeful and humanly absurd sense that reality is quicksilver and not necessarily fair but the human heart can in the end create its own moral universe.

Alfred Bester's new novel, *Golem*¹⁰⁰ (Simon & Schuster), may not quite involve the reader on the same empathetic or caring level as a Dick novel, but that's not Bester's intention here, I think; he has written and I guess you'd have to say "produced" a novel whose very *form* violates several of our conceptions of novelistic reality.

Incorporated into the text are pages of illustrations, pages that combine illustration with designed

prose, things something like fumetti, even a musical score, and there are whole key chapters that are... er... *done* in this unprecedented melange of prose and artwork. Originally, as I believe, Bester had done much of the "art" himself by clipping things from books and magazines, collaging them, and doing some drawing. Some of it was in *color*. Legal realities, practical restraints, and perhaps questions of esthetics led to Jack Gaughan's apparently drawing or redrawing everything to give it coherence, but he admirably maintains the stylistic diversity that would seem to have been Bester's intent. There is no color, but for Simon & Schuster to be willing to go this far off the typographic and layout deep end is miracle enough, ya want egg in your beer?

Now it can be said that the plot of *Golem*¹⁰⁰ is thin. A kind of electronic black sabbath in a future East Coast megalopolis somehow conjures up a monster from the id that rampages through Bester's colorful and bizarre future cityscape. The hero and the heroine try to find it and destroy it. They have allies. There is a whole zoo of weird minor characters. Two of the major characters go through complete personality changes. Themes and subplots arise and disappear, much schtick is thrown; the plot is not only "thin," it's as spaced out and confusing as the society in which it takes place.

Bester can drive you crazy with this. So much detail is piled on and so little traditional plot structure that it seems that this is a "realistic slice of future life" novel. But the future life of which it is a slice is so damned weird, so thoroughly scrambles conventional expectations, that taking it on a realistic level goes against almost anyone's investment of desire. Uncomfortable reading, though not necessarily in a negative sense.

The artwork is used mainly to carry the sections which take place in the archetypal "subworld" or to

depict eruptions of that subworld into "conventional unconventional prose reality." Appearances of the Golem, for example, are frequently rendered in combinations of prose and art.

And this, of course, not the "plot," is what the book is really all about. The artifact of *Golem*¹⁰⁰ itself is an interpenetration of prose reality by the reality of visual art, of pure image. "Reading" it, you pop in and out of the subworld like Blaize Shima and Gretchen Nunn, the hero and heroine.

And the ending . . . the ending leaves you gasping what? what? WHAT?

As a piece of conventional science fiction, *Golem*¹⁰⁰ may seem like a failure to some, or worse than a failure, something designed to frustrate expectations, whip your head around to no satisfying resolution, and drive you stark staring nuts.

Which, in a way, it is. This fragmentation of realities, this intrusion of one level of forms into another, is both the content of the novel, and the experience of reading it. The ending, which I certainly will *not* reveal, comes from so far out of left field plotwise and characterwise as well as tonewise and reality-level wise, that not only will you never guess it from either the book or this review, but you may end up feeling it has no relationship to the rest of the book at all. Which is both true and untrue.

*Golem*¹⁰⁰ is fragmentary, frustrating, confusing, messy, not resolved in any conventional sense, and even the damn title seems to be contrived to drive you up the wall just typing it. Never before has a science fiction novel so made form follow function or style follow content. A truly experimental science fiction novel in every sense of the word and one that achieves what it sets out to achieve. Further than anyone has previously gone in fragmenting, shaking up, violating, and throwing into question the conventional expectations of novelistic reality. "Inconscience fic-

tion" of the consciously created kind with a vengeance!

Gregory Benford's latest novel, *Timescape*, (Simon & Schuster) on the other hand, seems to be a departure in a very different, indeed one might almost say more traditional direction, for Benford, whose previous evolutionary vector has been towards higher and higher fusions of hard science and mystical impulse.

Benford, a working physicist as well as a novelist, had previously used his intimacy with science to telling effect in the service of his fiction, basically as background for stories which concentrated on the effects of space, the alien, and altered perceptual set on human consciousness. In *Timescape*, however, he has written a novel about physics itself, where the science is central in a way possibly unique in all fiction.

Timescape alternates between the scientific community of San Diego in the early 1960s, in what may or may not be our past, and a scientific community in Cambridge in what may or may not be our future. In the future universe, an ecodisaster is spreading as a result of decisions made in what may or may not have been the extended "present" of the reader, and so the English scientists are trying to send warnings back into the past via modulated tachyon transmissions, which are picked up in the 1960s San Diego time-frame.

The major characters in the novel, English and American, past and future, are all passionately engaged not merely in the technology of all this but in the actual science. Which, if it is pseudo-science and not the real thing, is pseudo on a level far beyond my ability to detect.

In the hands of a more trivial writer, this would have probably turned out to be a novel of time paradoxes on a more or less superficial level. In the hands of a "hard science fiction writer" with Ben-

ford's scientific background but without his human insight, it probably would have turned into a series of dry speculations on the theory of space-time, tachyons, and so forth, of interest primarily as "thought experiment."

But Gregory Benford is both a true scientist and a true novelist and so *Timescape* turns out to be a novel about the doing of science on *all* levels. Benford renders the thought processes of his scientists as they are doing their physics on an emotional and esthetic level, not merely an intellectual one. The politics surrounding the science are real, the personal lives of the scientists are real, the science itself is real in and for itself, and the actual process of doing the science is revealed from the inside as a personal, passionate, and esthetic enterprise which exists as the heart of the personal and political storm. C.P. Snow is famous for talking about the necessity of bridging the gap between the "two cultures" of science and the humanities, but Benford actually does it as perhaps no one has done before, showing the gap to be, in human, emotional, and esthetic terms, an illusion in the first place.

Incidentally, Benford also has the chutzpah to use a New York Jew working in Southern California, an American working in Cambridge, and an English aristocrat well connected to the Old Boy network as viewpoint characters without ever stumbling significantly into caricature or stereotype. In a way, *Timescape* is also a very English science fiction novel, more reminiscent of Aldiss, Clarke of a certain phase, Wyndam and Cowper than of Benford's previous work. Stately-paced, characterological, lacking in flash but not in depth, it is probably the most thoroughly transatlantic science fiction novel written by an American.

—Norman Spinrad



THE MAN WHO STOLE THE MOON

by Charles Sheffield

PERHAPS
THE ANSWER TO
GOVERNMENT REGULATION
IS PRIVATE ENTERPRISE.
VERY PRIVATE ENTERPRISE.

The line was quite short but it was moving very slowly. By the time they reached the service desk, three hours had passed since they entered the License Office.

"Application number?" The woman behind the desk did not look up at the two young men. She was in her mid-twenties, sloppily made-up and about forty pounds overweight. Her smeared make-up was a perfect match for the cluttered desk top and the battered metal filing cabinets behind her.

"I'm Len Martello." The taller and thinner man

was looking about him impatiently. "And this is Garry Scanlon. We've got an Evaluation petition in here, and we wonder what's happened to it."

"Yeah?" The woman looked up at them for the first time. There was no flicker in interest in her eyes as she slowly scanned from one to the other. "I need yer Application number. Can't do nothin' without that. D'ya have it?"

"Here's what we have. But it's not an Application number." Martello handed a slip of paper across the desk. He was thin, dark-haired and nervous, with sharp features and a pale, bony face. An old wound on his upper lip had healed to give him a twisted mouth and a skeptical, sardonic look. "We never received an Application number from you. All that came back to us was this, with a file code and an Evaluation petition acknowledgement. Look here." He leaned forward, trying to communicate his own urgency to the woman behind the desk. "We filed for the evaluation of our propellant *four months* ago, and we've had no answers at all. Not a word from here. What's the delay?"

She stared at the yellow slip for a few seconds, rubbing one hand against her pimply cheek. At last she shook her head and handed it back. "You got the wrong office. You shoulda gone to Room Four-forty-nine. You'll hafta go over there."

"But dammit, we asked downstairs, and they *told* us to come here." Martello had crumpled the yellow slip and stood there, fists clenched. "We asked the guard, and he was quite definite about it."

The woman shrugged. "He tol' ya wrong, then. Ya know, we only do applications in here. We *used* to do 'em, evaluations, but not now. I mean, not since I've been here. You'll hafta go to Room Four-forty-nine, nex' floor up."

Her look turned to the clock on the office wall. She began to pull tissues from a box on the desk and

transfer them to her shoulder bag.

"Look, we made six phone calls from outside, before we came over here." Martello's voice was furious. "Nobody seemed to be able to tell us where to go or what to do or *anything*. We've taken all day just to get this far."

"Yeah. But you shoulda gone to Four-forty-nine." The woman stood up, showing a thick bulge of fat over her tight skirt. "They do evaluations, we only do the applications. Anyway, I can't stay an' talk now. You know, I gotta car pool."

Garry Scanlon put a restraining hand on Len Martello's arm and stepped forward. He was fair-haired, pink cheeked, and slightly pudgy. "Thank you, ma'am." He smiled at her. "I was wondering, could you maybe call up there and tell them we're on the way? We'd like to see them, and we shouldn't have to wait in line all over again."

"Sorry." Her eye turned again to the clock. "You'll hafta start over anyway. I mean, they close same time we do, in another couple minutes. They won't see you today. I can't change that, ya know."

"You mean we'll have to begin the whole thing again tomorrow?"

"Guess so, yeah. Offices here open at eight-thirty." She picked up her bag and shepherded them in front of her, out into the corridor, then looked at them uncertainly. "Well, have a nice day," she said automatically, and was off, wobbling away on her high heels.

Garry Scanlon slumped back against the corridor wall and took a deep breath. "Christ, Len, there's another whole day wasted."

"Yeah." Martello was paler than ever, with anger and frustration. "God, no wonder we couldn't get any sense out of these turkeys over the phone. If they're all like her, I don't see how Government evaluations ever get done at all."

"So what do we do now?"

Martello shrugged. "What the hell *can* we do? We'll have to come back. We're trapped, Garry. It's going to be the same old crap. If we don't get an approval, we'll never get an industrial group to look at us. And we've agreed that we'll never get the bench tests done without outside financing."

He shook his dark head. "I hope the propellant's as good as we think it is. Another night in this crazy place, and I thought we'd be on our way back to Dayton by now. Come on, let's see if we can check in at the Y again."

He started to walk away, head bowed, along the dingy corridor. After a final, helpless look at the empty office, Garry Scanlon followed him.

"Yes, yes, it's here all right. Martello and Scanlon, right, Evaluation Request 41468/7/80. Now, if you'll wait a minute I'll run a computer search and see where it's got to."

The speaker was small and white-haired. He wore a flowered red vest, opened to show old-fashioned suspenders and a well-pressed white shirt. A carved wooden sign on the desk in front of him read: "Henry B. Delso—the Last One Left." He hummed softly to himself as he carefully entered the data request, pecking away at the keyboard with two gnarled fingers. When it was done he swivelled the display screen around so that they could all see it.

"Be just a few seconds, while it does the search. Rocket propellant, you said?"

"That's right." Len Martello swallowed. "A good one."

"Don't get many of those any more." Delso shook his head. "Well, here she comes."

The characters that filled the display screen were unintelligible to Len and Garry. They watched Delso, trying to read his expression.

"What's it say?" asked Garry.

"Not much." Delso shook his head again, and looked at his watch. "I'll get a hard copy output of this for you, and tell you how to read it. But I don't think it'll do much for you."

He leaned forward in his wooden, high-backed chair. "Look, how long have you boys been working on this?"

"Here in Washington? Just three days." Garry's pink face was earnest. "But we filed the forms over four months ago."

Delso nodded. "First application, right?"

"Yes. Did we file it the wrong way?"

"Nope. You did it right, evaluation request's on the right form, everything's in order there." He looked again at his watch. "I'm done for the day, just about. Gimme a hand here and I'll boil up a cup of tea for all of us—better for your gut than the stuff in that coffee urn—and I'll tell you what the problem is. Can't tell you the solution, wish I could. You'll have to figure something out for yourselves. Good luck on that."

He carried a battered shiny kettle into the back room, filled it, and came back. "Go bring the teapot and milk through here, would you? And get cups and a spoon while you're there." He plugged the electric kettle into an outlet on the wall behind him. "There we go. Three minutes, and it'll be boiling."

He leaned back. "So, you've got a new propellant? I'll believe you, even believe it might be a good one. But do you know what happens when you file your evaluation form with the Government here?"

Garry and Len looked at each other in bewilderment. Len shrugged. "I guess somebody here takes a look at it. And decides if it's dangerous for us to test it. If it's not, we get a permit from you and we go ahead and do the bench tests."

"Just so." Henry Delso was carefully measuring four spoons of tea into the big brown pot. "Sounds

very fair and logical, eh? And you know, it used to be. I've been around this office for thirty-five years—as long as we've had the evaluation procedure. When I first started here, I read *all* the applications—we didn't distinguish in those days between applications and evaluations, that only came in fifteen years ago. I'd take each application, and I'd study it for a day, maybe two days. For something like a propellant I'd dig out the relevant patents, and the engineering handbook. Maybe do a few calculations, see if things seemed to be in the right ball-park. And you'd get an answer, yes or no. It took a week, sometimes two weeks, from start to finish."

"But we've waited over four months," said Len.

"Right." A rueful smile. "That's progress, yer see?"

Delso looked around his office, at the ranks of file cabinets, the computer terminal, and the elaborate multi-channel telephone. "I had none of this in the old days. Look at what we have to do now. Rocket propellant, see, first thing I have to do is look up the Industrial Codes. I can do it in that book"—he pointed at a three-inch thick volume with a bright red cover—"or I can check through the terminal there. That tells me which Government departments must be involved in the evaluation procedure, where they are, and so on."

"Hell, if we'd known that we could have contacted them before we sent in the forms," said Len. "We could have saved you a lot of time here."

"Not the approved method." Henry Delso poured tea into three chipped cups and pushed the tray forward. "Help yourselves to milk and sugar."

He picked up a cup. "I can tell you the complete list if you want it, but it wouldn't help you. The law says that they have to be contacted from here, whether you talk to them or not. Let's look at just a few of them. Environmental Protection Agency, naturally—you have to get their approval, because you'll be

releasing some substances into the air. It might affect the environment when you do the bench tests. Center for Air Quality, same thing applies to them. Food and Drug Administration"—he looked at them over the top of his thick glasses—"didn't think of them, did you? You'll be working with new compounds, they'll want samples to test for the effects on humans, plants, and animals. Might be harmful effects there. Then there's Defense, they have to be involved on anything that—might have defense implications. Then, let's see, Office of Safety are on the list—with a new material test, they have to be sure there'll be no danger to workers who'll be involved."

"But we're the only two people who'll be involved!" Garry's eyes were bulging. "We don't want their stupid protection."

"Ah, but it's for your own good—you don't have a say in it. Where was I?" Delso leaned back, checking off on his fingers. "Health Department, naturally—they duplicate some of Food and Drug's work and some of the Office of Safety, but they have their own checking system and that has to be followed."

Len Martello's scarred mouth was more twisted than usual. "I just can't believe it. You mean we have to get approval from all those groups before we can get a positive evaluation from you—that we can't do any more testing until that's finished?"

"That's right." Delso handed him a cup. "All those groups—and we're just getting started. Equal Opportunity, there's a dilly for you. They have to be sure that your company will have a positive action program for minorities."

"But there's only the two of us in it!"

"Makes no difference, laws are laws. Then there's the Women's Civil Commission. They'll have to be satisfied that there's no sex discrimination in the operation—that's not considered the same thing as the minority question. Mustn't forget the Depart-

ment of Transportation, too. You'll need to get a clean bill of health from them, to ship your propellant."

"We won't be shipping any propellant!" Garry slammed the cup down on the old desk. "We'll be making it right where we test it. Damn it, Mr. Delso, these regulations are ridiculous. Why should we have to get approval from a whole bunch of places that won't have anything at all to do with the development?"

Delso pursed his lips and shook his head. "I can't disagree with you. You're five hundred percent accurate. That's exactly what I'm trying to get across to you. I can't change the laws, they've all been passed and we have to go along with them here. I think they're as silly as you do, most of them, but I can't break those laws—not if I want to see my pension in a couple more years."

Len Martello put down his cup and stood up. "Mr. Delso, I don't know all those laws, but I do know how to count, and I think I understand probability. How many negative evaluations from those departments would it take to kill our chances?"

"One is enough, for the evaluation to come out negative. You can always re-file, of course."

"And start all over again? Look, if we have to get, say, twenty independent agencies to approve, and there's just a one-in-five chance that any one of them will say no to us, do you see what that means? The probability that we'll get approval is down to four-fifths to the twentieth—less than one chance in eighty. Am I right?"

"Quite right, I'm afraid." Delso nodded. "Your arithmetic's probably right, and I'm sure about your conclusion. In the past ten years, since the last set of regulations came into effect, I can count the number of successful evaluation petitions from small companies like yours on the fingers of one hand. I tell you, I'm just trying to help, even if it sounds as though all

I'm doing is offering bad news."

"So what ought we to do?" Len sat down again and looked intently at the old man.

"You don't know much about law, do you? Either one of you."

"Hardly anything—we've never needed it."

"Well, let me give you some free advice. It's the best I can offer but I don't think you'll like it. If you ever hope to get a positive evaluation nowadays, go and hire a lawyer—a whole bunch of lawyers. And you'd better be ready to spend a year and a lot of money, if the petition involves advanced technology."

He peered over at their cups, buttoning his vest as he did so. "You've not touched your tea, either one of you. How old are you now, twenty-one?"

"Twenty-two." Len laughed without any sign of humor. "Twenty-two, and the more I hear, the older I feel. You're telling us there's no hope—this whole trip has been a waste of time."

"I'm telling you I don't think you have much hope, the way you're doing it now. But you're young, and space-mad from the looks of you. Don't give up."

"So what ought we to do?"

"You've got plenty of energy, and you want to work on the space program. I don't think you can get far these days on your own. Forty years ago, there weren't all these restrictions. Nowadays, you ought to join the Government, or one of the really big corporations. They can afford to hire a whole team of lawyers, and they can afford to sit and wait until all the roadblocks to permits are out of the way. You can't do that, you don't have the resources."

Len stood up again, and this time Delso rose also. He walked over to the door and took an umbrella from the hook behind it, then a heavy and out-of-style overcoat. "You can't wait—and it gets worse every year. I see it happening, right here."

"How long does it take to get an evaluation ap-

proved now?" asked Len.

"It varies. But I've never seen it happen in less than two years, recently—and I've got one here that's been ten years and we're still going on it. You have to get yourselves on the right side of the argument, and that means working with the big outfits—maybe even learning law yourselves. But I can tell you, if I were a young man now, and I wanted to have a career in space work, I'd be in the Government. I've seen too many youngsters like you come here and go away disappointed."

He maneuvered them in front of him, so that Garry and Len again found themselves out in the long-dimly-lit corridor. Delso held out his hand.

"Good luck to both of you, however you decide to go. I just wish I had something more promising to tell you, but I don't. You can't beat the system, not the way it is now. Things have just got too complicated these days. So don't beat it, join it."

He locked the door and walked away, a jaunty little man with an overlong overcoat. Len and Garry looked after him in silence until he turned the corner and was out of earshot.

"What do you think, Len? Is he for real?"

Martello scowled at the wall, with its dirty peeling paint and broken light fixtures. "I think he must be. He was trying to help us. Why should he want to make anything up? If we try and get a positive evaluation out of this place, we'll still be working on it when we're as old as he is."

"Then I guess we ought to do what he says." Garry Scanlon was leaning against the wall, his shoulders slumped forward. "I don't want to waste my whole life fooling with those damn-fool regulations. I want to do something *real*, get a real job where I can see results. Let's get out of here. When we get back to Dayton I'm going to write off for an application to the Space Program."

"You'll apply for a Government position?"

"Right. Why don't we both do it?"

"No." Len's face was thoughtful. "Maybe you should do it, Garry. You're the technical brain, and you ought to be producing where you'll be most effective. I'm just not ready to give up yet."

"But what can you *do*, Len? It sounds as though every year there are a bunch of new regulations and a longer approval cycle."

"Sounds like it." Martello shrugged. "Delso sounded pretty convincing, but maybe he only knows his own little area. I'm going to try another approach—I'm damned if I'll give up yet. Not while there's a whole universe up there, waiting for us to get our act together."

Evaluation Petition Request 41468/7/80. (Martello and Scanlon, petitioners). Request denied on the following grounds: Code A3T, Insufficient evidence of affirmative action plan; Code B77G, Failure to comply with Child Welfare Act A-15, Amendment 5; Code G23R, Failure to provide statement of intended uses of Inland Waterways; Code R3H, Insufficient evidence of adherence to Privacy Statute D-04; Code T1TF, Failure to provide evidence of recycling (materials SIC 01,03) in processing of limited supply substances.

Len—the ticket will be waiting when you get here (for the launch viewing, I'm afraid, not for the flight!). If you can get down to the Cape a day early I'll show you the sights. We've got two Orbiters in Maintenance. You'll see how far we've come since last time you were here.

Seen the new Lunar Treaty yet? It's a bummer. NASA's official line is that everything is fine, but you should hear the contract support staff. Nobody's ready to put a wooden nickel into space investment until it's clear who'll own what.

I was up at Wright-Patterson a couple of weeks ago, looking at hi-temp tiles. Know who I ran into in Dayton? Old Uncle Seth. Told him you were off studying law and I thought he'd break down and cry. Looks as though the old stories are right, he really is hooch-peddling on the side. Remember those cases in his garage every Christmas? He's in great shape, must be nearly eighty but you'd never know it. Pickled in his own product, it can't be too bad.

It looks iffy on *Lungfish*. The industrial consortium is backing off, not sure they can raise more money. Macintosh and his committee are against Government assistance, say it's more pie in the sky.

You getting near the end up there yet? Remember, if you can't take New York any more there's always a job here at the Cape. I've got so many equal opportunity quotas round my neck—be nice to have somebody round here who can change a light bulb without an instruction manual. I've never told anyone you're a budding lawyer, they think you're an engineering buddy from way back.

Don't get the wrong idea about this place, it's not all roses. I'll tell you some of my problems when you get here.

Stick in there with the tort and malfeasance. Jennie says hi.

Garry.

SUPREME COURT UPHOLDS DECISION ON POWERSATS. In a landmark decision, the Supreme Court today upheld last July's Superior Court finding that the construction of solar power satellites offers an unacceptably high risk to human life and health. In a seven to two decision, with Justices Stewart and Basker dissenting, the Court ruled that possible future power shortages cannot be used to undermine the force of existing laws. Microwave radiation levels near the receiving rectennas of the proposed power

stations would exceed recent Federal maximum levels by a factor of three or more.

In a minority opinion, the dissenting justices referred to the billion dollar investment that has already been made in the powersats, to the overwhelming need to build some independence from imported fossil fuels, and to the poor understanding of the effects of microwave radiation. Justice Basker stated: "We are condemning our children and our children's children to a life of reduced options, in order to satisfy a set of arbitrary standards on radiation levels that is neither clearly understood nor fully supported by scientific experts."

This ruling by the Court confirms similar decisions made by the European, Russian and Chinese Governments. The Japanese Parliament is currently debating the same issue. . . .UPI NEWS RELEASE.

"Assholes." Len Martello slapped his hand down flat on top of the newspaper. "They have no idea what they're doing. Here we are in the middle of the worst set of brown-outs we've ever seen on the East Coast, and those silly old bastards decide to cut off one of the only decent alternatives."

Garry Scanlon looked at him in surprise. Len was even thinner than the last time they had met, and his dark hair was already beginning to show the first strands of grey. The scar on his left upper lip seemed more prominent than before, pulling that side of his mouth up and giving a slightly manic look to his whole face.

"It's not just the Supreme Court in this country, Len—look at the rest of the countries, too."

"I am looking at them. Just because they walk off a cliff doesn't mean we have to. Ah, hell, what's the point." He folded up the newspaper. "I guess they don't care what happens twenty years from now, they'll all be dead."

He looked across the table at his friend. Garry Scanlon was showing his own first signs of aging. The fair hair was receding a trace at the temples, and he no longer looked as though his face had never felt a razor. There was a tough, straw-colored stubble on his chin, and his eyes were tired and black-edged.

Garry slipped a couple of dollars under the glass ashtray and stood up.

"Come on. We might as well get out of here and over to the launch site. I agree with you about the way they're handling powersats, but it's not just an isolated case."

"I know. I've been following the appropriations cycle in Washington. But I thought you'd be free of it down here. Your programs are on the move, aren't they?"

"Yeah. We're on our way up Shit Creek. It's as frustrating here as it was when we were just a two-man show, back in Dayton."

Len was shielding his eyes against the bright Florida sunshine. He whistled.

"Bad as that, eh? I thought you'd got rid of the problems when you joined NASA."

"So did I."

"So what's gone wrong?"

Garry rubbed at his chin and shook his head. "I just wish I knew. Last time I wrote to you we had, oh, I guess fourteen hardware developments stalled. We had four briefs in preparation, and just one piece of gear approved. Know what the score is now? Eighteen in evaluation, and *no* new ones approved. Zero."

They climbed into the buggy and began the short drive back to Launch Control. The half-liter engine had a top speed of less than forty miles an hour, but it was a real miser on fuel oil. Len struggled out of his jacket and held it on his lap as they puttered their way over the heat-soaked roadway.

"Are you telling me it's as hard to get anything

done in Government as it is outside it? I thought that was the whole point of the NASA job."

"So did I." Garry shrugged. "We have to fill out all the same bullshit, get everybody and his uncle to say yes. There's only one difference—I don't go broke waiting, the way that we did. That makes it a bit easier to take."

Ahead of them, the eight-wheeled support vehicles had finished their final service and were crabbing away from the foot of the gantry. A mournful siren began its booming call across the flat Florida landscape.

"Five minutes," said Garry. "Come on, we ought to be inside the blockhouse."

"One more minute." Len had descended from the buggy and was standing on the concrete, drinking in the scene in front of them. His face was excited. "My God, Garry, this is what it's all about. I should be doing what you're doing instead of fucking about up north. It will be years before I take the Bar exams, longer than that before I can do anything useful."

"Don't let this mislead you." Garry took his arm and began to draw him into the protected area. "This launch will look great—they always do. But we're down again by another twenty percent from last year. The Shuttle works like a dream now—whenever we can get approval to do anything useful with it. We've done all the easy stuff"—he waved his arm with its wrist radio—"but there's nothing new about antenna farms. Dammit, they've been around for fifteen years now. We *have* to see some new starts."

The siren had changed to a more urgent, high pitched note as they entered the blockhouse. Len went at once over to the display screen. The silver Orbiter with its solid boosters and external tank looked fat and clumsy, too squat and awkward ever to leave the ground.

"Two minutes," said Garry, sitting down next to him.

"So it's the way we figured it." Len didn't take his eyes from the screen. "We're going to lose out to the other countries—we won't even come in second."

"Maybe not that bad." Garry's voice was baffled. "I thought the way you did, until I went over to Geneva for the last joint meeting. Now, I'm not so sure. Hold it, now, we're on the final thirty seconds."

They sat silent as the last seconds of the countdown ticked away. On cue, the swell of flame appeared at the base of the rocket and the assembly began its first stately lift-off. Inside the concrete block-house, four miles from launch, the noise was still deafening.

Garry flicked in the tracking monitor, split-screen from the rising Shuttle and the down-range cameras. "She's away. Watch that status display, any second now we'll get solid booster separation. We'll have an accurate trajectory back here in a couple more minutes, but from the look of it she's going to orbit with no problems."

He turned away from the screen, swinging his chair to face Len. "That's what makes me sick. See those boosters? Ten years, and we still use solids. We should have had liquid reuseables years ago. The Space Tug's still on the drawing boards, and we're further from nuclear propulsion than we were in 1960. The International Affairs people in Washington are so sensitive about Test Ban agreements that we can't even *mention* nuclear any more, not even for comparative studies."

Len was still hungrily drinking in the displays. *This was the real thing—the action was here, not back in New York fiddling with precedent, regulation, and who won in Soriba versus Rockwell, 1982. What was the point of all that legal effort, if it didn't lead to this?* He watched until the final sign of the ascending Orbiter was gone from all the displays, then turned at

last to Garry.

"We *must* be losing out. I've been looking at the patents filed, things are going slower than ever. Our own system is killing us—strangling us. Remember our oath? At this rate we'll never do it."

"I know. But Len, you're wrong on one thing. We're not losing out. Everybody seems to be in the same boat."

"Slowing down?" Len's attention was suddenly all on Garry.

"And how. China, Russia, Japan, Europe, Australia—all over. Everybody has a space program in trouble. We keep trying to move ahead, but there's more and more red tape and bureaucratic bumscratching. You'll find this hard to believe, but we're not doing at all badly here."

"Everyone's strangling? What about the Brazilians?"

"Just as bad. Hell, if there were any place better, I'd go there, but I can't find a cure anywhere in the world."

Len turned back to the displays. On the one showing the launch area, a large black automobile was crawling slowly towards the pad. Windows of tinted glass made it impossible to see the interior, but it looked like a great hearse moving across the concrete. Len stared at it, a sudden speculation showing on his face.

"Maybe there is an answer. Garry, remember the oath? Meet on the Moon, July 20th, 1999, and drink a toast."

"We weren't the only ones that made it, I'll tell you that. Lots of the guys here did the same thing when they were kids. Better face it, Len, something took a wrong turn. A lot of us want space—millions of us, if NASA's mail means anything—but there's no *mechanism* any more. We've got technology, all we need. But we'll never make it through all the control

and half-assed regulations. You ought to recognize that, too. Come on down here, there's still a job for you."

"Yeah." Len's eyes were still fixed on the black limousine. "Maybe, if all else fails..."

"All else *has* failed. The bureaucrats are in charge, all over the world."

"Not quite. I haven't given up the idea of legal loopholes completely. But if it doesn't work, I have another thought. What's that limo out there make you think of?"

"Eh?" Garry turned to the screen. "The VIP tour car? Beats me. Funeral parlors? Al Capone and Lucky Luciano? Henry Ford?"

"Pretty close with one of those. Look, Garry, I need to bounce something off you. Can we go for another beer?"

Garry looked doubtful. "I told Jennie we'd be home early for dinner."

"Still interested in drinking that toast?"

"All right." Garry sighed. "I'll call and tell her we'll be late. I know a bar where they don't blast muzak down your ear. If we don't get through by eight, though, you'll have to tell me the rest of it over at the house."

The winter storm had surprised everyone with its ferocity. After three days at a standstill, the ploughs were finally beginning to make an impression on the Dayton suburbs. Len stood inside the bitterly cold garage and looked out through grime-coated windows at the blown snow drifts. He had been waiting for almost half an hour in the unheated building.

"All right." The big man had slipped through from the inner office so quietly that Len had not heard him arrive. "You can come in now. But hold still while I check you over."

"Somebody already did that."

"Yeah." There was a gruff chuckle in the darkness. "But that was twenty minutes ago. Meyer likes people who are thorough. O.K., you're clean. Keep your hands behind you and go on in."

Inside there was more light but no heat. Len shivered and walked forward to the old table. A little man with thick grey hair, carefully styled, sat behind it. Len received a long, measured stare before Sal Meyer again bent his head to the papers spread out in front of him.

"So all right." Meyer was wearing thick woollen gloves with just the fingertips cut away. "So you're Seth's nephew. Yeah, I can maybe see his look there. You're a Martello, you got the nose."

Dark eyes flashed up from their inspection of the papers and fixed again on Len's face. "You got fancy degrees, one in engineering and one in law. Now, you tell me what you want a job with us for. There's lots of other places you could work, no sweat for finding a job for yourself."

Len took a deep breath. "Money. I want to make a lot of it."

"You could do that in a law practice just as easy. Crooks, all of 'em, but you never see one in jail."

"But I don't see why I should work eighty hours a week, just to pay it in taxes."

That produced the first trace of a smile from Meyer. "You got me there. That's what I hated worst of all when I worked in City Transport. The big gouge, I call it." The smile was suddenly gone. "All right, you want a job with us. Now tell me what you got that I can't get better from Jake and Rocky behind you. Do it quick, before we all freeze to death here."

"I've talked to Uncle Seth. He wouldn't tell me much—"

"Bet your ass he wouldn't—not if he wanted to stay well."

"—but he made me think you've probably got prob-

lems with distribution, and maybe with quality control. I think I can help with both. I've controlled a fractional distillation line, I know how to check for fusel oils."

Sal Meyer held up his hand. "I talked to Seth, too. Look, I don't care about the quality end of it. If people are willing to drink it, or run their buggies on it, that's not my problem. Distribution is—especially with the way the pay-offs have been screwed up with the new Chief of Police. How greedy are you?"

"Try me and see."

Meyer grinned again. "Let me tell you the rules. I don't care where you make your money, how you spend it—except when it's in my area. I've got drugs, and I've got gambling. Anything that you make in that area, I take a third. If you want to get into booze and pimping, that's up to you. I don't ask for a piece. But remember, you get in trouble in those areas and you're on your own. I won't make one phone call to help you. If it's trouble you get into on my business, you'll have the best lawyers money can buy. You married?"

"No."

"Kids?"

"No."

"All right. For a married man, I look after the wife and kids if he goes inside." Meyer looked at Len curiously. "What do you do for fun?"

"I keep busy." Len cleared his throat. "I gather you're offering me a job, then?"

"I got an opening in Cleveland. Just so you know what's happening, the number two man over there got too greedy, started moving in on the hard drugs action. We've not heard from him for two weeks, and somehow I figure we're not going to. You'd go in as Number Three, and if you do anything decent you can move up fast. You want to ask me about money?"

"Not at the moment."

"O.K. That's the right answer." Meyer stood up and came around the table. He moved to within a few inches of Len and peered closely at his face. "How'd you get that lip?"

"Played ice hockey without a mask, back in high school." Len realized that Sal Meyer preferred short answers—something to file away for future reference.

"O.K." Meyer stepped back and gestured to the men behind Len. "Martello, don't tell the customers how you got that scar. It's worth money in your bank account. You'll have to organize a little enforcing once in a while—it helps a lot if you look as though you've seen action. If you need to reach me, do it through Seth or Jake here. You'll see me anyway, once a week. O.K. Jake."

"Thank you, Mr. Meyer." Len drew another deep breath as he was shepherded out into the main garage.

"Don't thank me, it's all business. So long, Lips, be seein' you next week. Oh, yeah, one other thing."

Len turned in the doorway. "What?"

"Tell your Uncle Seth he'll have an extra piece of change coming from me. And if you know any good people, let me know. Competence seems to get rarer and rarer."

He nodded, and the door closed.

"All right, Lips," said Jake. He shivered in the unlit garage. "Give this fucking snow a day or two to clear, and I'll show you round your area. You're part of the operation now. Remember one thing. Once you're in, you can't leave—so take my advice, and don't even think of it."

LUNAR AGREEMENT SIGNED. At a Special Session of the United Nations, marked by a parade of angry demonstrators along Fifth Avenue, the controversial Lunar Agreement was finally signed. All off-Earth resources of the Moon and all other natural

celestial bodies become, under this Agreement, the common heritage of all mankind, and the common property of all mankind. No organization, group, or nation may exploit those resources without paying compensation to all member nations, on a scale to be decided by the General Assembly.

Industrial representatives have pointed out that this Treaty makes it impossible for any corporate enterprise to continue to invest in Lunar development, or to plan the use of Lunar resources, since the basis for compensation to other nations remains unresolved. The Agreement has been defended by the Administration as the natural next step in the peaceful uses of Outer Space. Opponents of the Agreement deride this view, since there is an admitted escalation in particle and laser weapon beam development for use in near-Earth orbit. However, with the signing of the Agreement further debate on the issue now appears of academic interest only...

—UN Correspondent, N.Y.

"Yes, I've got it right here." Len looked up from the video screen, where Garry Scanlon's earnest face showed as a diminutive black and white image. He winked at Sal Meyer, waved him to a seat and turned back to the screen. "I read it the same way that you do, Garry—it'll have a bad effect. Remember what the Law of the Sea Treaty did to the industrial investments in deep ocean development? This will be as bad as that, maybe worse. Look, I'll call you tonight and we can talk about it some more. How's Jennie?"

Garry shook his head. "No change."

Len sat silent for a moment. Since the loss of the baby, stillborn, he had a feeling that a thin curtain had come down between him and Garry—the barrier that separated those with families from those without. "Do they think it was the drugs?" he said at last.

Garry shrugged. "Who knows? The Government tests and tests, and still they don't know what's good

and what's bad." His voice was bitter. "Len, I feel as though the whole world's going to hell. There's not a thing left working for."

"Stick with it, keep on working." Len's voice was gentle. "Remember the oath. I haven't given up hope, you know—and I may need help soon. Talk to you later."

While Len talked, Meyer had unabashedly been picking up and reading letters and notices that sat on top of Len's desk. That was something worth noting for future reference. Meyer had stopped at the Lunar Agreement article.

"What in hell's name is this doing here? You thinking of putting a few feds into orbit, Lips?"

"Wouldn't be a bad idea. You know they're walking all over our operations?" Len smiled. "It's hard to believe, but they suspect we're not paying all our taxes."

"Are the books all clean?"

"Trust me—*both* sets of them. They won't find a thing wrong. As for that article, don't ignore it. I think it might be very important to us."

Meyer picked it up again and took another look. "This? You're crazy. How could it have anything to do with us?"

"That depends on how good your contacts are. Look, Sal, you know the figures on the drug business a lot better than I do. How much will the new inter-country agreement on drug sources cost us? I don't mean local operations, I mean over the whole world, for us and others like us."

Meyer leaned back and squinted at the ceiling. Len knew what was going on inside that grey head. Figures were being recalled, summed, allocated and compared.

"Fifty, sixty billion a year," said Meyer at last. "That's assuming the sources dry up as completely as we think they will."

"All right. Now look at the taxes on *legal*

gambling—forget the other parts for the moment. How much are they, worldwide?"

"Thirty billion a month, maybe forty—depends what you call legal. So what? We can't find a home for drug production—you know they sniffed out and closed down the last three sooner than you could wink—and if we can't find a safe place for gambling activities, then what's the use of talking about it?"

Len reached over to the other side of the desk and pulled out another printed sheet. "I've got a place for drug production—one that won't get raided in a hurry by any government agency. Take a look at that while I get a cup of coffee."

The prose was flowery enough to raise Meyer's eyebrows as he read.

'A ghost still walks above the Earth. Blue-grey and silver, a hundred feet tall, it moves silently through the night and through the day, never pausing above any point. Like an uneasy spirit, it travels on and on... .

'Who is this spectre? It is the most expensive shade in man's history, a sad reminder of what might have been. It is the unoccupied hulk of *Lungfish*, the empty space shell that still sits up near synchronous orbit. The U.S. and European industrial consortium who funded the launch and assembly of *Lungfish* at a cost of more than two hundred million dollars have declared that the project to make use of it has been abandoned.

'The future of the empty shell (four million cubic feet of working space!) is now uncertain. The consortium would certainly accept any reasonable or even nominal offer—but who is likely to make one?

'Meanwhile, get out your telescope some clear night just after sunset. With a two-inch refractor you'll easily be able to see *Lungfish*. And broken dreams are up there with that ghost.'

"What the hell is this, Lips?" Meyer was still frowning over the piece when Len came back into the room.

"Space for sale—working space."

"Up there? You're out of your mind."

"Not if you try logic. Point one: you'll be outside the jurisdiction of any Government. They can't come in and close you down, because even if they could ever agree who would do it they don't have a space force in the U.N. Point two: I've looked at the economics of it. We could carry our materials up and our products down for a tiny fraction of their value. It wouldn't add more than a couple of hundred dollars a pound. For what we work with, that's like nothing."

"You'd never be able to land it."

"Not true. The Free Trade Zones would welcome a space facility. You'd have to grease a few palms with each cargo, but that's something we already know all about."

Meyer leaned back in his seat. "You're *serious* about this! I should live so long."

"Sure I'm serious—but we can't take step one with that damned Senator Macintosh blocking all movement on space manufacturing." Len came over to Meyer's side. "I'm dead serious. I'm even volunteering to set up the whole thing. Before I can do that, I need some encouragement from the rest of the operations that there's interest. Are you willing to carry it up the line for me?"

Meyer looked up at him sharply. "What's your angle? You looking for control?"

"I'd never be given it. No, I'm simple-minded. I want one percent of operations. And I'm willing to wait until everybody else has earned out their investment before I begin taking my percent."

"That keen, eh?" Meyer whistled softly. "You know, Lips, you've come on fast the past four years—some of the local operators say it's been too fast, but I don't agree. Tell you what I'll do. I'll take this over to





the Central Council meeting—give me all the facts you have—just to see what reaction it gets. There's no way it'll fly first time around, everybody has to let it stew for a while and look for loopholes. If you rush things, that's the death of 'em."

"I've waited a long time. I can wait longer." Len had automatically reached over into the left hand desk drawer and pulled out an indigestion tablet. Sal Meyer watched the movement, shook his head unhappily.

"Still got the ulcer? You should take a break sometime, go off to Vegas and get laid. When you get to my age, you lose interest in raising hell." Meyer stood up, grunted, and rubbed at his chest. "And the damn doctors won't let you do it anyway, even if you feel like it."

Len was watching him shrewdly. "You ought to be up in *Lungfish* yourself, Sal. You'll add years to your life—that's a nice effect of low gravity, no heart strain."

Meyer didn't speak, but Len saw the change in the hard old face. Converts were sometimes made in the strangest ways. Len spoke as Meyer was turning to leave.

"If we did go ahead with this—in a year or two, I mean—we'll need to put political pressure on a few people. For a start, that Lunar Agreement has to go."

"Well, if that's all we have to do, I'll be surprised." Meyer laughed. "I'll push it along, Lips—but don't hold your breath waiting."

"They'll buy it, Garry. But they want me to prove myself one more time. I don't know how."

Garry Scanlon looked across at Len, slumped in the rocker. The dark hair was grey, as grey as the face beneath it.

Have I aged that much? Garry thought. God knows, I've had the reasons. The baby, then Jennie.

"I can help, Len. Just tell me what you need. I didn't get much from the move to Headquarters, but at least I can pull a few strings if I have to."

"Not these strings, Garry. Who do you know over at the Department of Justice?"

"Couple of neighbors are there. You want me to keep you out of jail?"

Len smiled wanly. "It may come to that—I haven't told you what I've been doing, but I've gone a long way past old Uncle Seth. A long way. Right now, I want to arrange a meeting with somebody, as high up as you can get me."

"You're part of the group that's bidding on *Lungfish*, that ought to get their attention. What else do you need from me?"

"Nothing. The less you know, the better. Believe me, when the time comes for a trip out, you'll know the minute that I do."

"How long?"

A weary shrug. "Three years? As my ex-boss says, don't hold your breath waiting. Maybe you'll beat me to it, doing it the regular way."

"Uh-uh." Garry stood up. He was developing signs of a paunch and the rounded shoulders of a desk worker. "You should see the budget for next year. It's a disaster—we spend more in welfare in one week than we do on space in two years. Got a job for me out there, Len?"

Len Martello had closed his eyes. He was silent for so long that Garry wondered if he were in pain.

"Not right now, Garry."

And not this year. It's bad enough that I have to do what I'm doing.

"Maybe when we get the operation going," he said at last.

"You'll need specialists in chemical plants if you're really going into space pharmaceuticals."

"There's a few bridges to be crossed before we're

there. Big ones. Got a Congressional Directory? I need to dig out Senator Macintosh's address."

'Most men and women, at their deepest levels, are a complex combination of bravery and cowardice. It is the rare individual who has the pure essence, the complete courage or the true cowardice. Of all the professions, politics draws an unusually high percentage of both pure types. The difficult task is to determine with which one is dealing, since there are strong resemblances in their superficial behavior.

'It is much the same when we look at corruption. Politics presents a strange mixture of high and low ideals, the naturally corrupt and the incorruptible. The 101st Congress is no exception...'

Len read on, marking certain passages for future use. At nine p.m., the preset alarm sounded. The sixteen inch refractor set into the roof of his penthouse apartment was ready, computer-controlled on its target. *Lungfish* was rising. Slightly above synchronous orbit, its twenty-seven hour period took it slowly across the star field; it had less apparent motion than any other body in the sky except for the synchronous satellites.

The consortium was ready to prove their statement: *Lungfish* still had working communications with ground-based stations, and enough fuel in the mickey-mouse external thrusters to achieve attitude stabilization.

Len watched closely, but he could see no change. *Lungfish* was still only a point of light. He would have to wait for attitude telemetry to come down and prove that the station was still live and controllable, even though it was no more than the hollow husk of a working space station.

On impulse, he keyed in lunar coordinates. The microcomputer that controlled the telescope tracking took a fraction of a second to compute the relative

positions, then swung the system quickly to its new target. The Taurus-Littrow Range was at the center of the field of view. For the thousandth time, Len peered at the image, seeking in his own inner vision the tiny speck of the Lunar Rover from Apollo 17. The last trip out...

A sudden razor's edge of pain from his stomach made him gasp, then reach for an antacid pill. They were scattered all over the apartment, never more than a couple of paces away. The ulcer was under control, no worse than it had been a year ago—but no better.

Reluctantly, Len turned from the telescope and sat down to word the next letter.

"Congressman Willis? I think you ought to see this for yourself."

The aide had been waiting patiently outside the Committee Hearings. He passed a sheet of plain white paper across to the Congressman.

"Another one! This is intolerable." Congressman Willis was a big man, close to three hundred pounds, but the suit did a good deal to hide the swelling belly and thick neck. "What's in this one?"

"The same sort of thing—you'll be hearing more in the future, but you ought to look closely at your voting record."

"Hmph. Didn't do a bit of good last time, giving this to the FBI. Let me take a closer look."

"Congressman"—the aide was greatly daring—"Do you think this is genuine? This is the third one, and nothing has happened."

"And nothing will happen!" Willis stuffed the paper into his pocket and patted the young aide with a thick hand. "You go on back to the office, Ron. Don't worry about it, and I'll take care of the whole thing."

"Yes, sir." The aide's face cleared and he hurried off along the corridor, back to the Rayburn Building

office. Behind him, Willis put one hand out to steady himself against the corridor wall. A thin line of sweat had appeared up where his forehead met his thinning hair. Another one! The threat was vague, but it was there. And it was not the usual hint of financial pressure, of blackmail for past activities, of defamation. It would be physical violence, broken bones, torn flesh...

Congressman Willis had a vivid imagination. He could turn this one over to the FBI and have them again fail to find anything. Fail to protect him, too, when the trouble (the gun, the knife?) came to him. Or else he could take the phone call when it came, vote as he was directed to vote. That was a cheap price for freedom from the terrible fears that had been with him since the first letter. Damn the Free Trade Zone controls—first things first.

He leaned against the wall, white suit blotched with perspiration, and waited for the end of the Hearing Recess.

Len had made the decision personally. Now everything was falling apart, and there was no doubt who would get the blame. Already, Sal had called in and was telling him that the heat was on, that he had better have something worked out.

"I'll do what I can, Sal, but I need more facts. What made Mesurier renege on the deal?"

Meyer's voice was quavery over the line, and his video image showed him looking older than ever. He was being eaten away inside, the drugs doing no more than slowing the spread. "He's greedy, Lips. Pure greed."

"How much does he want?"

"I don't know. We promised him a hundred million."

"Right. Damn it, I picked the Cook Islands for the launch and free trade site because it's nicely out of the

way, and because the price was less than half we'd have had to pay to Papa Haynes in Liberia. Who's Mesurier's number two man?"

"Bartola." Meyer had caught Len's expression. "He'd maybe be easier to work with, but he's an unknown quantity. You thinking of putting out a contract on Mesurier?"

"No." Len was silent for a few moments. "Make that maybe. I'm not going to let a tin-pot dictator stop us when everything else is going well."

"So what are we going to do?"

Strange how their roles had reversed. Sal Meyer had become the dependent one, looking to Len for guidance...

"I think the threat should be more than enough. He'll get the choice, a hundred million for Mesurier, tax-free in a Swiss bank; or a dead Mesurier, and a deal with his second-in-command. He's no fool. The decision shouldn't be too difficult." Len glanced down at his desk. "Not like that damned Senator Macintosh. I can't see any way round him, and he's too brave to scare and too honest to buy. We need some angle on him."

"Stick at it, Lips." Meyer sounded a lot better now that the decision on Mesurier had been made. "I'll get the message back out to the Cook Islands. Rocky Courtelle's the right man to deliver it, he looks as though he'd kill his mother for a good cigar. What's the launch date going to be?"

"Two months from now. We've got the boosters for the upper stage, and we'll be taking the first work crew out there on the second mission. I'll be ready to brief the Council in two weeks, but I can already tell you that a lot of the usual production problems will disappear when we've got the Lungfish Station running smoothly. Then I want to hit them with the next step."

"Next step! I thought we were in business with

Lungfish."

"You'll be all right, Sal. We'll have you up there as soon as there's a medical facility running. But I mean the next *big* step. I want Council approval for a Lunar Base."

"On the Moon! What the hell are you talking about, Lips. You'll never sell them on that."

"Want a little bet on it, Sal? A hundred thousand, and I'll give you five to one odds."

"But why, for God's sake? We've got all the production capacity we'll need on Lungfish Station for twenty years."

"Capacity, but not *total* security. We'll have that when we have a Lunar Base, once we dig in there we'll be out of reach of anybody. We can set up a bigger facility and we'll be able to get the Arabs into the Casino. They say that the Lungfish Station is bad, it's where Mohammad's coffin is supposed to be—but they don't mind the Moon at all. How'd you like to get your hands on a few of those four hundred billion a year petrodollars? We'll make the fanciest Casino in the universe."

"You think you'll get Arabs to go all the way to the Moon to *gamble*, when they could be doing it at home? Lips, I hate to say this, but you sound all screwed up."

Len grinned. "Wait and see, old man. Wait and see. They'll go. Don't you understand, the Moon isn't part of the Moslem earthly universe—it's a place where all the rules can be broken without offending the religion. As far as they're concerned, it'll be *janat*, the garden of paradise. All the vices and none of them forbidden."

"On the goddammed Moon?"

"Why not? You've never been to the Empty Quarter in southern Arabia. After that desert you'd find the lunar surface a pleasant change. Here, before you cut out let me show you my first design. The more you know about this, the easier it'll be to come in hard on

my side with the Council."

Twenty minutes of coaxing, explaining, and summarizing didn't convince Sal Meyer. The financial analysis did that, as soon as Meyer looked over the basic budget and projected returns.

He shook his head as he finally cut the connection. "Damned persuasive, Lips. And you know what? It's not even an illegal operation."

"Never mind, Sal. You can't have everything. Who's going to tax us for money we make on the Moon? We don't *have* to be illegal to avoid the tax bite up there."

Like the Arabs, Sal Meyer had the sudden look of one to whom Paradise has become just a Shuttle ride away.

Len Martello was mortal. Like any mortal he couldn't cover *all* the bases. Development operations had been spread over a hundred separate corporations in thirty countries. Each company had become the instrument that cleared some roadblock standing in the way of *Lungfish*'s conversion to production and use. But there were connections between corporations, and that network—given enough time and patience—could be traced. On the day that Sal Meyer made a minimal acceleration ascent to the *Lungfish* medical facility (five thousand dollars a day; Meyer might feel the pinch if he had to stay there more than fifty years) late that same afternoon Len Martello felt the first thread of the noose.

"Len." The call was voice only, Garry Scanlon from Washington. "I can't talk long now but you've got problems."

"You bet I've got problems." Len was lying back in a reclining chair, moodily reviewing the proposed changes to the Lunar Agreement. "Do you know of a new one? Construction on the Lunar Base looks like being a barrel of snakes."

"Listen. I've been subpoenaed to appear before a Special Commission on organized crime. They sent a set of interrogatories with the notice. They're going to ask me a whole set of questions about you, what your background is, what you've been doing for the past twelve years, how much money you have—everything."

Len jerked upright. "Who's behind it?"

"Senator Macintosh. Remember, I told you once before I'd had his staff aides around to my offices in NASA, wanting to know how well I knew you."

"Damn. I knew in my bones that it was a mistake asking you to go on that check-out trip to the Cook Islands. I was in a box for somebody who really knew his launch procedures, but we should have kept you out of it."

"Len." Scanlon's voice was strained. "I'll protect you if I can. But I have to say this, I won't lie to the Commission. You've only hinted at some of the things you've been doing but I'll have to talk about them if I'm asked."

"That's all right." While Len had become more and more the loner, he knew that Garry had been steadily merging into the Establishment. Over the years there were less protests about the crippling lethargy in Government, more in his casual conversations about the responsibilities of the job of Associate Administrator. "You tell them what you have to. We'll talk when you're free to do it."

Len Martello returned to his work with a cold and furious energy. Macintosh, the old incorruptible. He had always been there on the horizon, a presence that Len couldn't convert or distract with other business. Could he be any more than a nuisance at this stage of the work?

Len reviewed the steps that stood between him and an operating and permanent Moon Base. Thirty of them depended on people and functions based in the

United States. Over the next sixty days, one by one, he substituted activities that could be handled by foreign interests.

On the sixty-fourth day, Len's own call to Washington was delivered by an armed marshal. With it came a lengthy set of written questions.

"But despite all that, Mr. Martello, I believe that I can see a pattern."

The kid gloves and the gentle touch were still in operation. Howard Macintosh, Democrat of Oregon, had handled thousands of witnesses, friendly ones and hostile ones. If he thought that Len was going to refuse to cooperate, that didn't show in his manner.

Len cleared his throat. "The only pattern I can see, Senator, is one of simple industrial development of our only remaining frontier. I have tried to promote our interests in space, that is all."

"And that you have done, remarkably well." Macintosh was short and thin, in his mid-sixties. Len had noticed a strange resemblance to Sal Meyer. They could pass for brothers, both from appearance and style of speech.

"But it raises a question of what you mean by *our* interests," went on the Senator. "Would you agree that the road to space has become strangely clear of roadblocks in the past few years?"

"You might think that way. I believe those 'roadblocks' were just that, impediments to progress. No one should mourn their disappearance."

Len noticed that Garry Scanlon had slipped into the back of the room as he was speaking.

"That is an opinion you are entitled to hold," said Macintosh. "Yet I find that there is, as I said, a pattern. Things went just the way that your group needed. Now we have a private corporation—"

"I don't know of any such corporation, Senator."

"—a corporation, I say, a *single* corporation, no

matter how much its integrated nature may be disguised. This entity now occupies the Lungfish Station, and has a permanent base on the Moon. It has passed beyond the control of any national Earth government, passed beyond even the power of the United Nations. I myself have had pressure from this group, attempts to subvert my opinions and my vote."

He paused. Since these were not public hearings, Macintosh was not indulging in any histrionics or impassioned oratory. He was a single-minded man with a basic objective. Len was suddenly glad that the Base was doing so well.

"I did not hear a question, Senator," he said at last, when Macintosh showed no sign of continuing.

"I am coming to it. Mr. Martello, I strongly believe that this *entity*, this powerful corporation which now has more activity in space than any country of the earth, is controlled by and the tool of organized crime."

He leaned forward, his manner intent. "I also believe that you, personally, know a great deal about the workings of this organization." With an instinctive flourish, he picked up a document from the long table and held it out towards Len. "If you will cooperate with us—help us to the limit of your knowledge—then I have already arranged that you will be given immunity for any crimes you have personally committed. This document, which you are free to examine, gives that guarantee from the Justice Department."

He handed it across the table. The room had gone completely silent. Len took the paper with trembling hands, surprised by his own tension, and looked at the Presidential Seal upon it. He read it through carefully.

"And if I do not act as you suggest?" he said at last.

"We will terminate our questions for today. You may return to your home." Macintosh paused. "For a

time," he said softly. "But Mr. Martello, that will not be the end of the story. I will continue to pursue this matter, as long as I have strength to do it. And you will not have immunity."

"A man who has done nothing wrong does not need immunity."

"How true." Macintosh shook his head. "But how many of us have done nothing wrong? Will you give me your answer, Mr. Martello?"

"I will give it to you, Senator." Len cleared his throat, then sat with head bowed for many seconds. When he at last looked up his face was white. "I decline your offer of immunity. If you have no more questions, I request that I be allowed to leave these Hearings."

The hubbub in the room took a long time to die down. As Len was leaving he caught Garry's eye—an incredulous, troubled eye. Behind him, he could hear the mutter of voices at the table as Senator Macintosh huddled with his aides.

After that last meeting of looks in the Congressional Hearing, Len had seen and heard nothing from Garry for almost four months. His phone calls had not been returned, two letters had gone unanswered. That Garry should arrive, uninvited, at the penthouse apartment that Fall evening was doubly surprising. Even as a youth, Garry had made all his appointments in advance.

"Alone?" Garry looked round and snaked into the apartment almost before the door was open fully.

"God help us!" Len was laughing. "Who's after you, Aunt Wilma?"

"No joking." Garry went over to the window and looked out nervously. "I took an Eastern Shuttle flight to get here—paid cash. Have to be back before anybody knows I've left."

"You can come away from the window—we're

thirty floors up. No one's going to be looking in. Garry, what the hell's going on?"

They sat facing each other, Garry with his overcoat still buttoned.

"You're in bad trouble, Len. A week from now, you'll be in jail. Macintosh has enough to put you in for tax evasion—I talked to one of his aides, and he told me a lot more than he ought."

He was short of breath and his words came out in wheezing bursts.

"It's not too late, I know that. If you come back to Washington with me, agree to cooperate—you'll still get immunity. Will you do it, Len?"

His expression was pleading. Len shook his head slowly.

"I *can't* do it, Garry. You don't understand the situation. They'd give me immunity so they could get at the top guys in the operations, right? But I've not been level with you. For the past two years, *I've been the top man*. Think they'd give *me* immunity? Anybody else in the Council, maybe. Me? Never."

Garry's plump face flushed and his mouth gaped open. "You're the top of the whole thing? That was why you walked out of Macintosh's hearings!"

"Not the only reason. Here, you need this." He passed across a tumbler of scotch and soda. "I had an even better reason—not just my own skin. Look, Garry, how's the NASA program doing now? Budget and projects."

"You've read the papers. Since you got *Lungfish* and the Lunar Base operating, we've started a big joint program with ESA and the Russians. I can't quote you all the details yet, but I'm sure my area—Tracking and Data Analysis—will double."

"And the year after that I'll bet it will double again—as soon as Congress finds that our group is going to build a Farside Base and start lunar mining. They'll be so keen to stop us that money won't count."

Len lifted his own glass. "Let's drink to crime. Don't you see, people only seem willing to pour money into something when they act out of fear—that's why Defense can get fifty times the budget of the peaceful programs. Well, now everybody has somebody they can mistrust: me."

The light was dawning in Garry's eye. He took a huge gulp of scotch, choked on it, and spluttered, "But that won't do *you* any good, Len. You'll be rotting in jail."

Len Martello stood up and walked over to the telescope setting. He switched on the control for the big refractor and opened the opaque cover on the penthouse roof.

"I'll rot in jail—but they'll have to catch me first. Garry, it's bad news but I've been expecting it for a long time. Look at this, tell me what you see."

"Mm. Serenitatis? Let me get the focus right." Garry bent over the eyepiece for a long second. "Yeah. That's Taurus-Littrow there. Long time since I looked at that."

The familiar sight somehow had calmed his excitement. He grinned up at Len, then bent again to look at the lunar image. "You've put your base there, right? No chance of seeing it with this, though."

"Not yet. Just wait a few years. We began with the Casino, now we're into low-pressure agriculture, power generation, medical plants. It's beginning to grow. But I'm not just telling you that to show off, you know. How long do you think it will be before there's a U.N. team sent up to try and close down that operation?"

"Couple of years, not much more. You know that they relaxed the ban on nuclear rockets, just in the hopes that we'd come up with something that would make sure you were under control?"

Len operated the switch to close the covers on the telescope. "Think you'll be on that close-out team?"

"Well . . ." Garry shrugged. "I'm a pretty high muck-a-muck these days. If it's an official inspection team, chances are pretty good that I can work my way onto it." He grinned. "You can be sure I'll try like hell to go, but so will a lot of others."

"Know what they'll find there?" Len went back to his seat. "It's a one hundred percent legitimate business venture—no sign of crime. The only reason we needed the crime in the first place was for muscle—to get some of those damn-fool regulations pushed out of the way, and to give the financial base."

"But it's too late for you, Len." Garry's expression was serious again. "It may be clean now, but it wasn't clean when you started. I know that. We'll be up there, and you'll be in some damned jail down here."

Len Martello leaned back in his chair. He looked tired, ten years older than his forty years, but his eyes were still bright. "I deserve to go to jail, Garry. I can't deny it." He raised his hand to still the other's protest. "Sure, I went into the game with good intentions. But I found out one thing very quickly. You can't work up to your elbows in dirt and expect your hands to stay clean. Not just the tax evasion. I had to get into the drug sales, and the enforcement, and the strong-arm tactics. I wouldn't have lasted a month otherwise. But good ends don't justify means."

He shrugged his thin shoulders, watching the shock spread across Garry Scanlon's face. "I deserve to go to jail, there's no argument on that."

"Maybe." Garry's face was a mixture of emotions. "Maybe you do. I won't judge that. But I know this, Len, if anybody ought to go on the lunar trip, it's not me—it's you." His voice was earnest. "You touched dirt, sure you did. Lots of people back in Washington will be happy to crucify you for it. But I just want to say that I'm sorry about it all. If I could give you my place on a trip up to the Lunar Base, I'd do it—gladly."

"Thanks, Garry." Len's voice was so soft that he was only just audible. "I know how much that means to you. Don't think I don't appreciate it, and the fact that you came here to warn me the way you did.

"But you know"—he grinned, and suddenly there was a trace of the youth of twenty years earlier in his smile—"you don't need to give up anything for me. They'll come and get me in a week, right? Know where I'll be then?" He jerked a thumb upward, toward the unseen orb of the Moon. "If they want me, they'll have to come and get me. I'm betting that I can keep a move ahead of the posse, all the way out. We'll have full mobility over the lunar surface in another four years. You'll have to develop that if you want to catch me. How long will that take?"

He raised his glass. "Come on, drink up and we'll get you out of here before you miss that last shuttle. Know what I feel like? In the old days they'd hang a carrot out in front of a donkey to keep it moving along. That's me. As long as I'm out there, you don't need to worry about the health of the space program—they'll have to keep going and catch me."

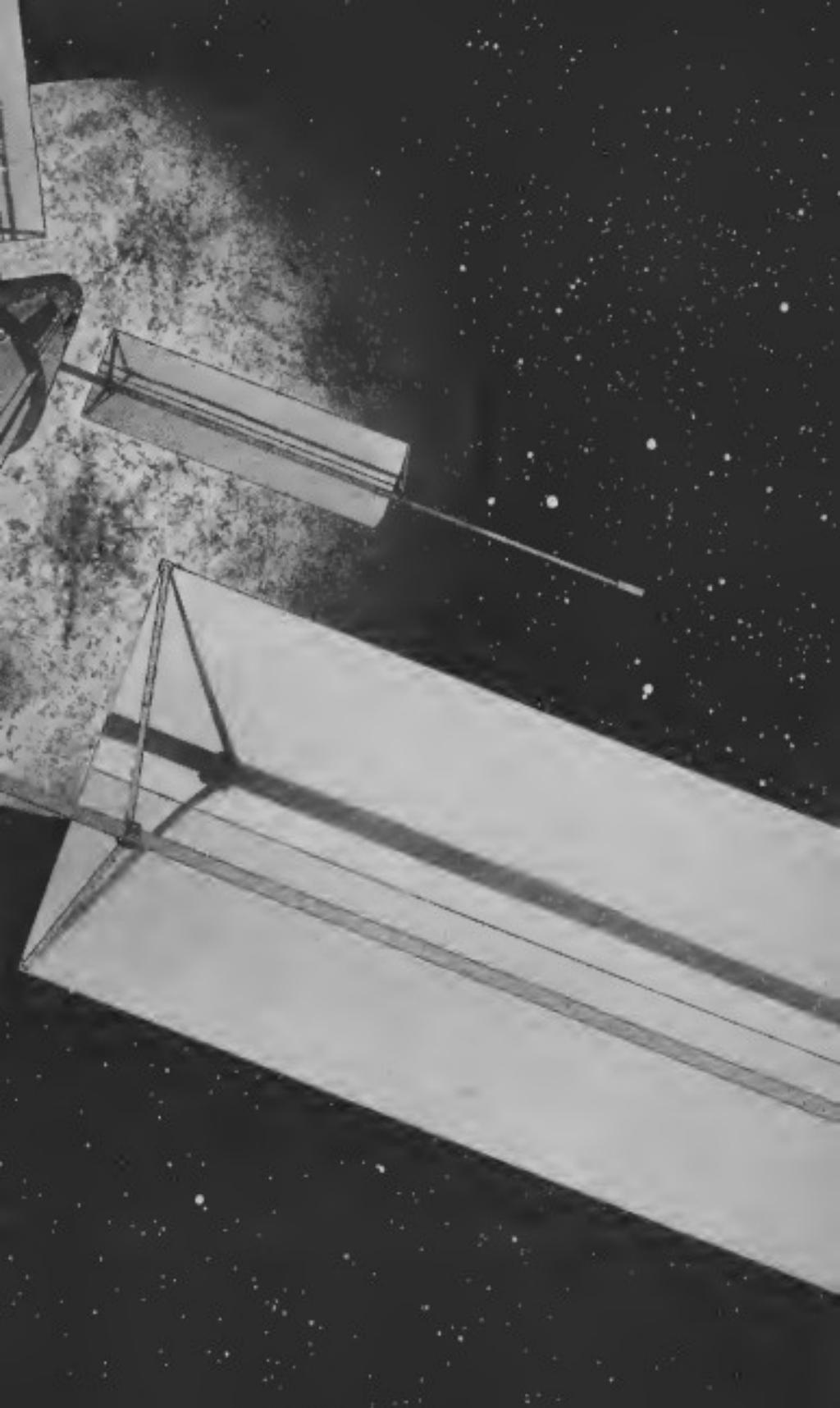
"You're right." Garry smiled and picked up his glass. "National pride would never be satisfied to leave you out there. We'll be chasing you."

"A toast then." Len shrugged. "It's not the one we've always wanted, I know, but there's still time for that. It's a few years yet to 1999. I'm betting we'll still drink that one—and we'll drink it where we've always wanted to. For now, let's just drink to the Space Program."

"No." Hesitantly at first, then with increasing resolve, Garry raised his own glass. "This time, *I'm* going to propose the toast. The Space Program is fine, but I'll give you something better. Here's to the carrot—and long may it hang out there."

—Charles Sheffield







THE L-5 REVIEW

The Editors of L-5 NEWS

THERE SHOULD BE RANTING,
THERE SHOULD BE RAVING.

BULLETIN FROM THE MOON TREATY FRONT

H. Keith Henson and Carolyn Henson

"Congress is on the brink of war over a treaty . . ."

—*International Herald Tribune*, Nov. 3-4, 1979

On the Fourth of July 1979 the space colonists went to war with the United Nations of Earth. The proximate cause was the Moon Treaty, reported out in a surprise move by the UN Committee on the Peaceful Uses of Outer Space (COPUOS), on the Third of July. The Treaty makes no provisions for the civil rights of those who go into space. In fact, it authorizes warrantless searches of space structures by any Earth-based government that signs the Treaty. In that vein a delegate to COPUOS commented, "But of course

people in space will have no civil liberties."

The "common heritage" provisions of the Treaty will stifle creative private initiative by prohibiting private property, and limits the economic system to a single undefined "Regime." All investment decisions would be made by governments through a UN-type organization. This type of controlled economic planning is alien to the US, though standard operating procedure for countries like the USSR.

The Administration has publicly supported the Treaty. They cosponsored the resolution adopting the Treaty in the General Assembly on December 5, and, but for L-5's efforts over the last several months, were prepared to sign and steamroll the Treaty through the Senate.

The tangible results of our lobbying are:

—Testimony given by Leigh Ratiner and Keith Henson before the House Committee on Science and Technology.

—Larry Winn (Ranking Minority Member-House Science and Technology Committee) refused to give a State Department speech favorable to the Treaty at the UN.

—Chairman Frank Church and Ranking Minority Member Jacob Javits of the Senate Foreign Relations Committee have gone on record in a letter to Cyrus Vance asking that the Treaty be renegotiated. A number of other senators have supported this view.

—Chairman Don Fuqua of the House Science and Technology Committee has expressed grave doubts about a Treaty which so discourages private enterprise development of space resources.

In the process L-5 has made a phenomenal media impact. The Moon Treaty Fight has been favorably treated by magazines and newspapers, including the *New York Times*, the *Washington Post*, the *International Herald Tribune*, *Business Week*, and the *Wall Street Journal*. The *Journal of Commerce and Science*

have reported on the Moon Treaty as well. Even companies are beginning to oppose the Treaty. United Technologies placed a quarter-page ad on page 2 of the February 14 *Washington Post* headlined "Stranglehold on the Moon."

We may have stalled Presidential signature of the Treaty. A letter to Frank Church from Cyrus Vance states, "The Administration has not yet turned to questions relating to signature of the Treaty or its submission to the Senate." But the UN approved the Treaty on December 5 unanimously, without comment or vote, and opened it for signatures on December 18.

With the US Department of State, Treaty opponents arguing that "The US has nothing to gain from signing the Moon Treaty" have initiated an inter-agency review of the lunar agreement. NASA, the Departments of Defense, Interior, State, Treasury and Commerce and possibly Justice will participate in this policy debate. They have targeted May 30 to make their decision on whether or not to ask Carter to repudiate the Treaty.

In the January issue of *Astronautics and Aeronautics*, American Institute of Aeronautics and Astronautics (AIAA) Legal Task Force member Delbert D. Smith responded to charges by Treaty opponents. According to Smith, the Treaty's "common heritage" clause would not necessarily impose a UN veto power over space activities and the "equitable sharing" clause should not be construed as requiring mandatory space technology transfer to other nations. In order to assure that the Treaty would be interpreted favorably to private industry, Smith proposes that the US Senate express reservations to the Moon Treaty.

However, a staffer on the Senate Commerce Committee has warned L-5 Moon Treaty Committee members that the International Court of Law at The

Hague does not recognize unilateral reservations or even interpretations of a treaty made during negotiations. "If there's a question of meaning," he pointed out, "they look to how that language has been used in other international agreements."

Rep. John Breaux (D-LA) is worried by exactly this point, warning that "common heritage has already been used to impose a seabed mining moratorium," using the 1970 UN Resolution on the Deep Seabeds.

But AIAA Administrator of Public Policy Jerry Grey, at the Annual Meeting of the American Association for the Advancement of Science January 5, speculated that refusal to sign the Moon Treaty would seriously prejudice "US ability to conclude the cooperative agreements which are essential to US participation in potentially lucrative global markets."

Grey's position, like that of many other Treaty supporters, appears to be that the US has no choice but to accept the Treaty, fearing that otherwise the nation would be branded as uncooperative. However, other nations have developed cold feet on the lunar pact. The Treaty has only been signed by Chile (Jan. 3) and France (Jan. 29). Venezuela has informally indicated it will not sign unless the US does so first.

Meanwhile, Congressional opposition to the Treaty continues to grow. On January 11 Senator Howard Cannon (D-NV), Chairman of the Commerce, Science and Transportation Committee, announced three studies on the Moon Treaty. These studies, being conducted by the Congressional Research Service, the Office of Technology Assessment and a former Moon Treaty negotiator, Eileen Galloway, will prepare Cannon's committee for the hearings he will hold if President Carter appears likely to sign. Meanwhile, five members of the Senate Foreign Relations Committee, Chairman Frank Church (D-ID), Jacob Javits (R-NY), Dick Stone (D-FL), S. I. Hayakawa

(R-CA) and Richard Lugar (R-IN) have expressed serious reservations regarding the acceptability of the Treaty in the Senate.

Over in the House, James Santini, Chairman of the Mines and Mining Committee, has joined long-time Moon Treaty opponent John Breaux, who chairs the subcommittee on Fisheries, Wildlife Conservation and the Environment, saying, in a January 17 letter to the L-5 Washington representative Leigh Ratiner, "I applaud your efforts to protect the interests of the United States and make sure that the 'common heritage' clause in the treaty will not be used against US commercial interests in the future."

To date, no member of Congress has come out in support of the lunar agreement. The Treaty makes about as much sense as fish setting the conditions under which amphibians could colonize the land. But it could hold up space development for a long time, perhaps decades, by discouraging investment in space industries. If space resources are developed under this Treaty, the inhabitants of space may have no place to work save the "Regime," no place to spend their wages except to the Company Store, and no place to live but the Barracks.

Against the Lunar Treaty,
James Baen

(Originally presented as a floor speech following a debate on the proposed Lunar Treaty at this year's Goddard Symposium, a function of the American Astronautical Society)

AGAINST THE LUNAR TREATY

The points at issue in this debate have all been touched on by previous speakers, which makes it all the more strange to me how shockingly polite the tenor of these talks has been. There should be ranting,

there should be raving. Could it be that even those of us who share the dream of Mankind outgrowing Cradle Earth are incapable of holding within our mental grasp the enormity of what is at stake?

I am *dismayed* that after even a superficial examination that this proposed agreement has not been laughed out of court. Except in language so general and ambiguous as to rival the proposed treaty itself I have heard not a single good word spoken for this document. Even its *proponents* claim as its main virtue that when it has the force of US law it will not *necessarily* have evil effects.

It *might* not delay or abort the entry of private enterprise into space processing, power generation, and general resource use.

It *might* not be used by so-called "public advocates" to stifle any space-based economic development whatsoever.

It *might* not limit our liberties as Americans to the surface of this planet.

It *might* not authorize, for the first time in history, the taxation of Americans in international territory by a foreign power.

But it *might*.

The one sure thing about this agreement is that we get absolutely nothing in return for selling out American private enterprise to totalitarian socialist regimes. In a deal that would have boggled even Lenin—the man who said that capitalists would sell the rope for their own hanging—The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies mandates that we give the rope away. Note carefully that this is a modified version of a treaty introduced by the Soviet Union.

Of the many reasons to be opposed to this agreement, not the least is that the Russians are for it. Remember Potsdam? Yalta? Helsinki? Salt II? Historically the Russians have proved far more skilled

than our own negotiators at the treaty game. Could it be that once again the Russians see some advantage for themselves that the Americans have failed to notice? But perhaps the Lunar Treaty is different.

This time the American position is very subtle indeed. It is that we can blithely sign this document because it is so muddily composed with respect to its negative aspects that it will be impossible to wrench out its semantic content, if any; while if we refuse to countenance it we will be considered uncooperative. Not Nice Guys. The entire advocacy position boils down to *that*.

I am bemused that sane, competent, loyal Americans can favor our execution of this document.

The 1980s: Key to the Future Gerald Driggers

The entire world, and the United States in particular, is entering a decade of unparalleled significance in the history of humanity. This is not only a statement based on simple observation but also one founded in quantitative analysis of a number of key indicators by several investigators. From 1976 to 1978 I was fortunate enough to be a part of (and manage a portion of) the NASA-sponsored study of space industrialization (SI) conducted by the Science Applications, Inc., (SAI) team in parallel to a Rockwell International team headed by Krafft Ehricke and Chuck Gould. Our team at SAI consisted of Peter Vajk, Harry Stine, Bob Salkeld, Ralph Sklarow, Paul Siegler, myself, and a panoply of notables in various specialties. In the early stages of that study we concentrated on defining what the future environment on Earth would be like in several arenas (economics, society, politics, military, natural environment, etc.) and what could be done in space under our concept of "industrial activities." In the latter area the study defined four general categories that

encompassed those space activities which might attract business or provide for pragmatic benefit to the public at large if undertaken by the government. These categories were: information services (communications, remote sensing, navigation, data transfer, locators, etc.); products (ultrapure materials, alloys, crystals, foam metals, etc.); energy (solar power satellite, light reflectors, remote energy controllers, etc.); and people in space (tourism, hotels, hospitals, etc.). Literally hundreds of possible applications of space were catalogued under these four headings and systematically examined for realistic potential as a future part of the space enterprise.

Over the course of the study many of these opportunities were examined in detail to determine how much of a market or need existed for them. A span of possible utilization rate vs. time was developed to scope the level of activity which could be anticipated. Eventually these results were coupled with the future scenarios being developed in parallel and a set of possible future evolutionary paths for space development derived. The results were somewhat astounding. We had anticipated perhaps a possibility for a few billion dollars worth of non-government space-related revenue around the turn of the century; instead the results showed a potential for tens-of-billions and growing so rapidly as to become hundreds-of-billions by about 2010.

Excitedly, we examined the implications of such an incredible result. Again the results were astounding. Millions of new jobs were created on Earth; tens of billions of dollars in tax revenue were generated; an export potential in excess of our current imbalance of trade (otherwise known as the "balance of trade deficit") was possible; the Gross National Product would increase by 15-20%; and ever-increasing numbers of people would be working and visiting in space, all of this occurring in an "everybody gains"

environment. There was one hooker: we have to put in a lot of hard work in the Eighties.

Cause for rejoicing? Did you see headlines reading "United States to Return to Non-destructive Growth Economy" or "Space to Pay Off Big" or anything like that? Nope, because the message was too good; and instead of pursuing the next steps leading to a formulation of plans, a definition of programs, establishment of government/industry relationships, and broadly informing the public, the whole subject was canned. To go into details as to why it was canned would serve no constructive purpose; that's a story I'll leave for the historians to unravel. Besides, it's the results of the study and related subsequent efforts that are crucial to our society.

To set the stage for future articles which will deal with specific aspects of both the SAI and Rockwell studies and other space-industrialization-related activities, I would like to present the following observations made at the end of our study. Keep in mind that the challenge presented here has not been met, and a void exists. Also keep in mind that this was written in 1978 and that the Moon Treaty is before the Administration for signature today.

Observations: (1) Foreign competition is becoming very strong in SI. It is no longer "our" domain and these pressures will increase. This may limit or spur increased US involvement.

(2) The developing and underdeveloped nations of the world may consider the US and SI a threat or a powerful tool for progress depending on how we promote it.

(3) Prospects for economic return to the government (public sector) are excellent, so long-term investments should be justifiable. A few billion dollars invested in the Eighties will result in hundreds of billions in tax revenues, millions of jobs created, strong economic growth and positive balance of

trade impacts in twenty years or less.

(4) Although some US industry will resist SI, a strong support base can be built among US private enterprise.

(5) In both domestic and international law there are no legal entanglements which will seriously inhibit SI development, if we develop proper policies and stick to them!

(6) Although many social and political institutions will be affected by SI, the most significant are those institutions governing industry and government relations and those relating the US to the rest of the world. Nothing precludes mutually beneficial arrangements in both of these arenas. Historically, such arrangements have taken years to evolve.

(7) The most important SI initiatives would appear to have rather high initial investments and payback periods longer than normal for private investment. A mechanism for reducing initial risk and shortening these payback times is possible and will attract substantial industry support upon initiation.

Recommendations: (1) Strong industry involvement in all areas of SI from planning to ultimate operations is necessary to return maximum benefits.

(2) A central group, perhaps under the Administrator of NASA, especially tasked to plan, integrate and advocate SI activities, is needed badly. Such a group, located within the government, may indeed be essential if private enterprise cannot meet the challenge on its own.

(3) Space industries will need 25 to 75 KW of raw power in the early-to-mid-Eighties, 100 to 500 KW in the latter Eighties and 1-10 MW in the early-to-mid-Nineties. A solar power satellite prototype development program to prove technical/economic feasibility and environmental acceptability would have similar milestones and characteristics. Space power needs for products have a similar progression, with

the possibility of a three- to five-year lag in demand relative to other requirements. A space power program designed to integrate and synergize these requirements should be initiated, beginning with development of the 25 KW power module currently proposed. The requirements for a concurrent large structures program are implicit in the power program.

(4) The cost of space transportation to low Earth orbit must come down below Shuttle projections by a factor of 10 to 100 to really open the products market in the Nineties. The Shuttle is the key, but the longer-term SI requirements are already apparent. Increases in flexibility and decreases in cost are needed by high-orbit operations in the latter Eighties for both services and energy initiatives. Propulsion and vehicle programs to meet these needs should be integrated into future transportation planning.

(5) The US (probably through NASA) should embark on an intensive data gathering and planning effort during FY '79, '80 and '81 in parallel to initiation of early projects such as a 25 KW power module. This effort would culminate in a carefully coordinated, evolutionary Space Industrialization Plan with domestic and international as well as government and industry segments.

The above recommendations imply only modest budget commitments over the next three years (less than five million per year in studies and planning and less than fifty million per year in hardware commitments). The budget requirements for development and implementation of initiatives with early direct returns (mid to late Eighties) plus long lead technology development for the Nineties has a funding peak of less than four billion dollars annual. That cost could be shared in various ways between NASA, other government agencies, private industry and international (or foreign) organizations. The space

technology peculiar funding requirements are less than two billion of the four billion total.

A great deal of work remains before space industrialization enters the mainstream of government and industry planning, and a proper public understanding is achieved. A solid information base, a dedicated advocacy group and very hard work are the essential ingredients to accomplishing these objectives. The rewards will be worth the effort, and attaining these goals will turn space industrialization into the mechanism for achieving the next plateau of human development.

After completion of the space industrialization contract, I used the data developed under that effort to conduct an unfunded study which resulted in a paper for the 1979 Princeton Conference on Space Manufacturing titled "Is Lunar Material Use Practical in a Non-SPS Scenario?" Yes, it makes economic sense to use lunar material in the development of space industrialization along the lines of information services and products activities as defined in the SAI study. Since the availability of lunar material represents the largest single step toward human independence in space from Earth, this appears to be a highly significant result. Thus it becomes even more important that the United States never become party to an international agreement or treaty which will stop our free development in space or inhibit the obtaining, by segments of our social structure, a rightful portion of the Solar System's resources.

From all of this study and definition activity have evolved a few repetitive and crystal-clear messages. First, a synergistic public and private space effort is absolutely essential to promote the rapid development of space. Second, if we don't really capitalize on the unique capabilities of the Shuttle in the Eighties, the tremendous potential of the Nineties and beyond for the United States and the rest of the world will be

slowed down, at best. It is quite possible that too slow a pace will allow our problems to overtake us and a rather lengthy stagnation set in.

Space is positive and good and smacks of growth and new opportunity and adventure. There is excellent, reasoned justification for such an attitude, and therefore we have excellent, reasoned justification for a desire to visit and/or work and/or live there. To my knowledge, the L-5 Society is the only international organization that acknowledges these as reasonable desires. Therein lies the fundamental stimulus for the leadership role the Society must take in the very near future. Through the coming year the *News* will carry more details on the reasoning and justification behind space industrialization and the stepping stones which must precede large-scale development and human habitation in space. From these materials, most of which already exist, will come the constituent parts of a public awareness campaign, a political activists' movement, research activities and a host of relationships with business, community groups, national and international organizations.

The 1980s are the key to space development, but it is a two-key system. No other organization, government or private, has taken on the task of coordinating or promoting space development or human development along the positive, future-oriented lines that seem so obvious to most of us, and such an organization is the other key. The L-5 Society must become the second key.

News Briefs

An ocean surveillance system for tracking Soviet ships and submarines was launched from Vandenberg AFB in California on March 3. The three-satellite constellation was deployed by a USAF Agena stage built by Lockheed. The Agena was launched atop an

ex-ICBM Atlas F.

The first flight test for the Space Shuttle orbiter Columbia has been officially set for late November (at the earliest). The launch is anticipated no later than March 1981. The completed installation of the 30,922 thermal protection tiles still remains the packing item. About 12,000 tiles (including replacing those that don't pass the full test) are yet to be installed.

General Dynamics Convair Division has been contracted by NASA to define a possible large antenna demonstration program to be flown in the Shuttle in 1986-87. NASA has no currently approved program for doing any large-structure work in space.

American Telephone and Telegraph Company is expected to launch a new series of communications satellites starting in 1983. Included will be the capability for a nationwide two-way television conferencing. The satellite will probably be built either by Hughes Aircraft Company or Ford Aerospace and Communications. The initial launch is planned using the European Space Agency's Ariane vehicle.

* * * *

On January 28, George Brown (D-CA) introduced a bill to enact a national space policy. The emphasis of the Brown bill (HR 6304) is closer to that of the space policy bill Senator Adlai Stevenson, Jr. (D-IL), introduced last year than to the approach adopted in the virtually identical bills of Senator Harrison Schmitt (R-NM) and Rep. Robert Dornan (R-CA) (S212 and HR 4316).

* * * *

In the most important report to come out of Washington in months, the General Accounting Office warned that the Government needs to spend two to three times more on materials research for space manufacturing than the \$20 million in NASA's

budget—just to enable the US to maintain parity with other nations.

The report concluded that other nations, while not yet ahead of us, could overtake the US in the near future.

According to the report, private sector interest in investing in materials processing may currently be low. McDonnell-Douglas is scheduled to test a pharmaceutical project in space, and several other "joint endeavors" with NASA are in the negotiations stage, but real and perceptual barriers are inhibiting more private sector involvement.

The main barriers identified by GAO are the high risk, high costs and lengthy payback periods associated with materials processing, along with fears about Government regulations concerning such issues as patent rights and anti-trust, and economic problems in generating a sufficiently large market for goods produced in space. In order for this country to remain internationally competitive, GAO concluded that the Federal Government must be prepared to: (1) complete essential basic research, (2) fund a large share of developmental and demonstration research, and (3) plan and commit enough resources for whatever follow-on facilities and transport services are needed to enable future private enterprise activities in space.

Unfortunately, GAO concluded that current funding levels will not permit these necessary actions to be taken. It maintained that increased backing from the Administration and Congress are required to realize the high expectations for space manufacturing among American scientists.

—The Editors of *L-5 News*

[*For Robert Heinlein's comments on the proposed Lunar Treaty, see page 386 of this issue.*]

ON PREDICTING THE FUTURE: SHAKING UP SPACE

by Frederik Pohl



IT IS AT LEAST THEORETICALLY
POSSIBLE THAT THE SUN'S
ENGINES COULD BE TURNED OFF
NOW, BUT THAT IT WILL BE A
MILLION YEARS BEFORE WE KNOW IT.

The other day in Seattle I had the pleasure of paneling with two distinguished theoretical physicists. Roger Freedman teaches the subject at the University of Washington; George Harper writes about it, for publications like the *Brit. Astron. Journ.* and *Analog*. Mt. St. Helen's was shaking and belching off to the south, along the Oregon border, the first volcanic activity in the lower 48 states in my lifetime; and while George Harper was explaining how everything came to be born out of the universal ylem and Roger Freedman was telling us how it would die, in the decay of protons thirty decillion years from now ("Oh, thank God! At first I thought you said thirty billion!"), I was trying to look intelligent enough for the company I kept. Actually, it was an extraordinarily stimulating occasion. Apart from the volcano and the cosmologies there was a Richter 5.0 earthquake going on just off the coast, and besides we were at a science-fiction convention. (Norwescon III, and I was Fan Guest of Honor—but that's a whole other story.) And while Harper was drawing pictures of doughnut-shaped cosmoses and Freedman was explaining what quarks do to nuclear particles, I was thinking about the relationship between earth shakes and astrophysics. You don't believe there is one? Well, actually there are several, but let's start with the one I was thinking about.

The way you locate the epicenter of an earthquake is with seismographs. A seismograph is essentially a sturdy and solidly mounted little piece of machinery which contains a weight that is free to wobble when something shakes the instrument; the weight moves a lever arm, and the lever scribbles a pen (or some other recording device) over a moving sheet of paper (or sometimes film) when it feels the tremor. If you clock the moment when each of a group of widely

separated seismographs reacts, you can then plot a circle around each instrument. The source of the vibration lies somewhere on each of those circles. The point where the circles intersect is where the earthquake took place. Scientists have been doing that for a good long time with earthquakes. Last year they did the same thing with a vastly different class of objects on a vastly different scale.

On the 5th of March of 1979 a very brief, very intense burst of gamma radiation passed through the solar system, and was registered on a number of instruments. Nine of them happened to be aboard satellites scattered around the system. (None of them were put in those orbits for the specific purpose of monitoring that burst, because no one knew it was going to take place—chalk it up as another fringe benefit of the general space program.)

What that burst of gammas came from is a fascinating question, to which, unfortunately, there are at the moment no good answers; it may be that we have discovered still another class of intensely radiating objects, unlike anything ever detected before. But almost as fascinating is what happened with those nine space observations. The time of each was quite accurately measured. And by plotting the time when the burst was received at each point in space in the same way that earth tremors are plotted in seismology, the point of origin of all those gammas was identified. It turned out to be an object called N49. It is an old supernova remnant, and it is not located in our galaxy at all. It's in the Large Magellanic Cloud, a quarter of a million light-years away.

Think a minute about what that feat of location implies. It is as though someone had popped a flashbulb near Marble Arch in London, and we, in Seattle, had pinpointed it there, and not at Tower Bridge or on Hampstead Heath, by timing the light received at nine photoelectric cells—tiny ones—

small enough so that all nine would fit in a circle about the size of the point of a pin.*

To be sure, the technology involved in this space observation is remarkable. But for that technology to work requires something even more remarkable: the thing Einstein told us about three-quarters of a century ago, the invariant stability of the speed of light.

There has never been a more law-abiding traveler than the photon of light. It speeds not, neither does it slow down, and it keeps its place in line. That gamma burst leaped from the surface of the burned-out supernova almost a quarter of a million years ago, and for all those years each individual particle marched in step, in a column less than two hundred miles long, so that the whole thing arrived in order at the neighborhood of our Sun 1,400,000,000,000,000,000 miles away. If some of those photons were faster or slower than the others by as little as one part in one quintillion the location experiment would have failed. Now, that's what I call a sure-enough *constant*.

Such invariant constants are what the mathematical models of science are built on.

Since the human race has been around for what is no more than the wink of a gnat's eye in cosmic time, a lot of things that look pretty constant to us aren't, really. (Not even the atom is stable over the long periods Roger Freedman was talking about.) The quantity H_0 , Hubble's figure expressing the rate of expansion of the universe, is only more or less constant—it will not possess the same value a billion years from now that it has now. (That's what the little subscript "o" is for, so it can be written as H_1 or $H_{1,000,000,000}$ as the universe ages.) According to

*For the purposes of this discussion I am neglecting the fact that the curvature of the earth puts an awful lot of rock in between London and Seattle, and I would appreciate it if you would do the same.

some heavy thinkers like Paul Dirac even *g*, the force of gravity, isn't constant either, although that's still arguable. The real constants are the ones that *never* change—*pi* and *e* and *h* and all the rest—and they not only make science possible, they do the same thing for life. For if the values that describe, for instance, the charge, mass and other parameters of nuclear particles were anything other than what they are, the atom would be a quite different thing. Chemistry would happen in a different way, and perhaps it wouldn't happen at all. And if chemistry didn't happen, neither would life.

And yet—some of them really do seem rather capricious. Can you think of any reason *why* light should always travel at the same speed? Or granting that it does, why that speed should be 186 thousand miles a second and not, say 185? A few constants seem to make intuitive sense. For instance, it is hard to imagine any circumstances in which the ratio of the circumference of a circle to its diameter should be anything other than 3.14159 et cetera. Others do not. If there is a logically necessary reason why *c*, *e*, *h*, the mass ratio of the proton to the electron, the fine-structure constant and others should have their present values, I personally do not happen to see it.

Indeed, some thinkers, like Tong Tang at Cambridge, suspect that at least some of these values are pure accidents. Tang thinks it is possible that they may have been caused by random fluctuations in particle density in the first few microseconds after the Big Bang, and if the exploding universe had expanded in slightly different random directions we would have a whole other set of "invariant" constants.* This is an intriguing thought, because some

*As some may recall, I have been playing with this notion in a novel called *Beyond the Blue Event Horizon*, which is why I don't intend to do so at much length here.

of those perhaps-accidental constants are a real nuisance. If *c* were a thousand times its present value, for instance, those old science-fiction stories about hopping over to Alpha Centauri on a weekend might be almost possible. If we could change them, at least temporarily or locally, we might be able to do ourselves a lot of good, one way or another.

We might even be able to get to that fusion-powered Beulah Land the nuclear-power people have been promising us. Long years ago, around 1954, when the first British reactor was built at Calder Hall and the outlook for fusion power seemed more immediately hopeful than it does now, one of the English physicists was asked what he would do if it turned out that the fundamental physical laws prevented small-scale nuclear fusion reactions. "Why," he said, "we'll just have to change the fundamental physical laws."

If Tong Tang's conjecture is correct, those "fundamental physical laws" were defined at a point so early in the history of the universe that most particles had not yet come to exist and even the four fundamental forces—gravity, electromagnetic, weak and strong/nuclear—were essentially interchangeable.

Is it possible to create that sort of environment again? Even very briefly, in a very small space? Not bloody likely, one would say; but plasma physics has a long way to go before its limits are understood. I would personally bet against the attainment of cheap nuclear fusion power, by this means or any other, within the next half century or so . . . but you never know. I would have bet against the programmable hand-held pocket calculator, too, and now I own a couple.

I said there was more than one connection between shakings of the Earth and astrophysical events.

Another such lies in a book called *The Jupiter Effect*, by John R. Gribbin and Stephen X. H. Plagemann, which I have been reading with more than usual attention lately.

The reason I have been reading it is that it relates to a story I am writing, but it's worth a read on its own merits. I start by saying that I don't believe things are going to happen exactly the way Gribbin and Plagemann predict; but I have no way of being *sure*.

What Gribbin and Plagemann say is that in the early part of 1982 most of the planets will be on the same side of the Sun, an event which only happens once every 179 years or so. This, they say, will impose strains on the core of the Sun, where the nuclear reactions take place which cause it to emit heat, light and other radiation. These strains, they suggest, may cause it to change its radiation levels in such a way as to slightly heat up the atmosphere of the Earth. The increased heat will cause the atmosphere to swell. The swelling will increase the moment arm of the Earth's effective radius (like a skater sticking her arms out to slow her spin down). Not much. But enough, perhaps, by means of coupling through friction with mountains, trees and wavetops, to make a slight "glitch" in the Earth's diurnal spin. (These glitches do happen, although it is not clear just why and not many other people think they are related to solar radiation.)

All that is interesting and, if not always consensual scientific wisdom, at least reasonable speculation. It is the next step that is the killer.

There exists, Gribbin and Plagemann say truly, places on the Earth's surface where immense stores of seismic energy are stored up, waiting for a trigger to release them. The stored energy comes from the slow crawl of the Earth's tectonic plates, moving but stuck at the edges by friction; the trigger need be only quite tiny, just enough to break the sticky part loose.

A glitch might be big enough. And then all that stored energy will shake the Earth with great violence—will, be, in fact, an earthquake, and a big one, and the place that Gribbin and Plagemann think most likely to suffer is California, where the San Andreas fault has been waiting for decades for an excuse to break loose.

As they put it in the book:

A remarkable chain of evidence, much of it known for decades but never before linked together, points to 1982 as the year in which the Los Angeles region of the San Andreas fault will be subjected to the most massive earthquake known in the populated regions of the Earth in this century. . . . in 1982 'when the Moon is in the Seventh House, and Jupiter aligns with Mars' and with the other seven planets of the Solar System, Los Angeles will be destroyed.

Ray Bradbury, A. E. Van Vogt, Forrest J. Ackerman, H. L. Gold, Harlan Ellison and all you other dear friends in Los Angeles—are you listening?

Well, I already said I didn't believe it would happen exactly that way. I'm quite doubtful about some of the links in the chain of reasoning—notably the change in nuclear reactions because of the position of the planets, on which the exact timing of the event so firmly depends. Even if the pull of the planets did in fact play hell with the fusing core of the Sun, I do not really think it would at once knock out Los Angeles. There is the matter of the missing solar neutrinos.

On thinking it over, I am not sure just how much reassurance the missing solar neutrinos will give anyone, but let me run over the situation anyway. As you all know, for some years scientists have been trying to detect the flow of neutrinos that really ought

to be coming out of the Sun if it is indeed fusing hydrogen into helium in its core the way it is supposed to be. The task of detecting a neutrino is not easy, since it is so tiny and chargeless that it slips right through most matter without a trace. The "telescope" for observing the Sun's neutrino flux is a great big tank of cleaning fluid at the bottom of a mine shaft. The way you observe it is to wait for the odd neutrino to interact with the odd atomic nucleus, and watch the spray of particles that comes out. This has been going on for a number of years now. Although watching for these infrequent events rates high among the most boring jobs in the world, it is not quite as boring as the job that is about to begin of standing by ten thousand gallons of protons (in the form of ordinary water), waiting for one of them to decay every six weeks or so. A fair number of neutrinos have in fact been caught and counted.

But not nearly enough.

So something is wrong—either with the "telescope" or the theory . . . or maybe with the Sun. Because one reasonable hypothesis is that the telescope is doing its job and the theory is right on, but the Sun has stopped fusing.

It is easy to see that this has unpleasant implications. If the Sun has stopped fusing hydrogen into helium, then it has either switched over to some other nuclear process or it has stopped generating energy entirely. In the first case, we don't know what to expect, which is worrisome. In the second case we know exactly what to expect, and that is even more worrisome, because it implies that the Sun will go out.

Probably you are now breathing a sigh of relief; after all, you looked out the window this morning, and there it was, still shining. Well, that's not really any guarantee. Energy generated at the core of the Sun does not spring to its surface, and thence to your

window, at 186,000 miles a second all the way. Before it gets to the surface of the Sun it needs to fight its way through some very dense material, and the process takes just about a million years. So it is at least theoretically possible that the Sun's engines could be turned off now, but that it will be a million years before we know it.

(You may be breathing another sigh of relief, because you're not going to worry about something that won't show up until the year 1,001,980 A.D., are you? Well, don't feel *totally* secure. The neutrino telescope has been going for less than ten years. There is nothing to say that the Sun's fire didn't go out 999,990 years ago and we'll start to shiver tomorrow. I don't *really* think this is the case, either—it's easier to believe that the theory is somehow wrong. But there it is, just one more damn thing to worry about.)

Anyway, that's the reason why I don't expect the Gribbin-Plagemann Jupiter Effect to smite Los Angeles as soon as the planets wheel themselves into position, in the spring of 1982. Events at the core of the Sun are not really likely to affect its radiation that quickly. Even if the events actually do occur.

But I wouldn't feel too relieved about that, either. Not if I lived in Los Angeles. Everything Gribbin and Plagemann say about the San Andreas fault is gospel. It's sitting there, waiting. It has been storing up energy for around a century—a little more, in the southern portion around Los Angeles, a little less near San Francisco—and it is well overdue to go off. As to that, the only place where my opinions differ from Gribbin and Plagemann is in the nature of the trigger, and the time when it is pulled. I don't think the time of maximum danger is the spring of 1982. I think it is every minute of every day, including this one.

—Frederik Pohl

Gordon R. Dickson

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FRANKIE THE RAT MAN & BARON VON RONK

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PEEPING FRANKIE,
HE DONE HER WRONG.





JANET E. AULISIO



FRANKIE THE RAT MAN

jaunty Frankie, king of the rats,
lord of the cagedom, dispenser of Death
on either hand—

left hand, Test Dose #1. If not lethal
right hand, Test Dose #2 equals ten times
Dose #1
(repeat until lethal).

Frankie, dancing Frankie, jaunty Frankie knight of the labcoat white, sneakers with a rat's paw inked in black on each, Frankie injects his rats to establish the lethal level of new chemical #460-80-4641 in new rats so that people old and young like Frankie don't accidentally die from too much #460-80-4641.

Frankie whistles a happy tune down the passages of Rodent Hall, noting fatalities in the columns and rows, the rows and columns of his Klipboard, whistles a happy tune noting subject rats in need of a second dose (no sugar pills from Frankie) with a

dainty, dancing script-OdnL/I-10x, Original-dose-not-lethal/increase-tenfold.

Frankie, whistling Frankie pauses at cage L-1208 to peer at a pair of eyes as red as the caps on fencers' blades, to mask the point behind, the point of it all. Rat L-1208 has had a 10,000 mmg dose of #097-34-8435 and is, says sassy Frankie, "Healthy as a horse!" Rat L-1208 will join the magic circle of six-dosers, and in honor of his fortitude will get a name. Frankie considers, decides

Baron Von Ronk.

"Von Ronk," Frankie prepares a 100,000 mmg dose of #097-34-8435, "Von Ronk, you're a survivor. I'm an admirer of them as (plunger back, drinks from sample) takes it comin' (plunger forward, pushes out air and one glistening drop of #097-34-8435) and keeps on hummin' (needle deep in rat flesh). Get a load of this (plunger like blasting dynamite)." Frankie, explosive Frankie, removes the needle, strokes the fur, says "Live to join the 1-gram club, now—don't let me down, mate," and Frankie swaggers off, "or it's the incinerator for you."

Frankie, frolickin' rollickin' Frankie finishes his appointed rounds at International Control Experiments—MANchester and leaves his labcoat hanging on the hook

to seek pleasure in the night, in the polychromatic polypeptide polyandrous Polymer Parlors of MANchester, to seek release in the ecstasy of X-Tol, of D-Vine Day Tryp (dimethyltryptamine-4)—WOW! Frankie boogie'n Frankie rolls into the DEN, there to meet J-Jo the Black Box Prince and his sister, Frankie's girl Queenie. Jo-Jo and Queenie are AID's—Alternate-IDentity folk—he with his Blue Band (2nd Way), she only Orange Band (3rd Way). Together, the three come alive in the nighttime. No need to watch the HoloVid in the corner with its inevitable Pro-Sports. No need for a couch near the dancefloor to

gander the latest Flop-Flip steps. Freed from the need for Biofeed, they.

"Tops, Pops," says Frankie as he eases into the cubic with Jo-Jo and Queenie.

"Top," says Jo-Jo.

"Top," says Queenie.

"Who be you two tonight?" Frankie could hazard a few guesses, but he'd rather untie his sneakers and sink his ten bottom ones into the floorfizz, so soft, so very, very soft.

"I'm my own Protopsych tonight, just regular Jo-Jo. Queenie's a Cajun, full of magic and voodoo."

"Eye of newt and all that?" Frankie's eyebrow quizzes.

"Believe," says Queenie.

Jo-Jo takes SuperSnuff, "First word out of her tonight," and sneezes. "How's tricks at the ratworks?"

"Copecetic," the Word come round again.

"Any one-grammers?"

"One on the way."

"Name?"

"Baron Von Ronk. Approve?"

"Has a ring. Tintinabulates, my man Frankie. What's your pleasure tonight?"

Frankie needs no menu, though the DEN has endless combos of uppers, downers, over-there's; drugs for the hipper, tripper, flop-flipper; chemicals to separate the lobes and recombine them quadrant by quadrant; associatives and dissociatives, sociables and unsociables, safe and hangover-free. Frankie needs no menu because Frankie can close his eyes and SEE the greens and blues, the reds and oranges of the color-coded capsules, can HEAR the mnemonic Baby Bobby Rolls Oval Yoyos, Gives Bad Vibes, Good Wine to remember, Black for narcotic, Brown for non-narcotic, Red for addictive, Orange for non-addictive, Yellow for ecstatic, Green for euphoric, Blue for associative, Violet for dissociative, Gold for

low-strength, White for high-strength. Frankie sees and says, "Tonight I need old friends and good memories. I'll have me an Amy White and a glass of Mellow Yellow," Amy short for a derivative of the amylopsin from sheep pancreas (a wooly warm high full of childhood memories), Mellow Yellow just a smooth Spanish sherry laced with psilocybin.

"A time-tested recipe," assents Jo-Jo the Black Box Prince.

"In the bayou even the snakes have ears, and the pawpaws, eyes," says Queenie, and her own eyes, more hooded than usual, are yellow as pawpaws and gorgeous to Frankie, Gorgeous Queenie his love.

"Tell me, Jo-Jo, boy wonder, when will you alternate-ID's get into animal psyches?"

"There's an Ultraviolet Band (7th Way) in PORTchester who claims his seventy-second identity is that of an ape named Lazy Days. Claims his Mastershrink can corroborate a full schism into ape-ness, ape-hood, you know."

"But you have your doubts?"

Jo-Jo snorts more SuperSnuff. "There is the hand, and there is sleight-of-hand. Sometimes only the wrist knows which is which." Sneezes long and hard. "Why, Frankie Frankly? Do you want me to be a rat? Do you want to know rat-ness? Remember, even my proto-identity remembers only the external life of my other identities. Each sees the outside of the other only. When I am Lucky Lucy, girl blackjack dealer, I know some womanness, but Jo-Jo the Black Box Prince knows only man-ness and remembers only the deals."

"But Lucy, Lucky Lucy could tell me about woman-ness."

"But rats don't speak. If I became an alternate Baron Von Ronk, I could only look at you with my beady eyes and blink."

"Would you understand if I spoke to you?"

"Perhaps. But then the schism would be incomplete, and I would feel my rat-ness incompletely."

"But I might talk and you might listen."

"In other words, I blink my eyes once if yes, twice if no?"

Frankie bows, swallows his Amy White and Mellow Yellow from the hands of a waitress dressed in a jumpsuit of simulated goatskin, and agrees.

"And what would you ask?" Jo-Jo, puckish Jo-Jo, wry prince of the black box, knows input, knows output, conjures throughput.

Frankie feels the tug of memories and barely manages "The meaning of life" before he gives himself over to a wash of childhood memories, to the tide of times past.

On the next day Frankie reaches the lab subdued in the embers of memories of Christmases and motorbikes, of butterfly collections and pet gerbils in Habitrail mazes, reaches work to find four new trays of numbered chemicals and Baron Von Ronk, alive.

"So," grins Frankie, "you've survived to join the elite one-grammers. You are to be admired. I doff my cap." Frankie makes an elaborate gesture with an imaginary hat. "Are you looking forward to the next dose?"

Baron Von Ronk blinks twice.

"Oh. Rather be out of your cage hustling your own grain, eh?"

Baron Von Ronk blinks. Once.

So as not to spoil the make-believe of the moment, Frankie asks no more questions. "I'll be back at 1600 hours to dose you. Don't go away." Frankie strolls along his rounds, whistling a fugue of his own composition, a fugue that might have been lilting if that hadn't been a contradiction.

"Want to meet my trained rat?" he asks Queenie at lunch. Today she has left her Cajun identity for one as

Anne Sexton, aggressive woman attorney. Called her Dollar Identity because she controls it well enough to work part-time, this particular identity grates on Frankie, but he grits his teeth in the JB taco and tries his best to make conversation.

"Toilet-trained?"

"No. Carries on a conversation."

"Blinks its eyes, one for yes, two for no?" cross-examines Queenie.

"You were listening last night."

"Cajun trances are not truly self-centered."

"How analytical."

"Better to analyze than to talk to rats."

"You don't believe me?"

"If I believed that kind of malarky, I'd never make judge."

"Do you want to make judge?"

Queenie wipes her lips carefully, tucks her napkin under the edge of her plate, and presses the tips of her fingers tightly, unerringly together. "Does Upjohn make pills?"

When Frankie takes the gram of #097-34-8435 to Baron Von Ronk, the last cotton-candy memories have faded and Queenie's courtroom manners have slowed Frankie's dancing white sneakers. "Sorry to have to do this, Von Ronk, old prizefighter. Where do you want the needle?"

The rat stares at Frankie from the back of the cage.

"Guess I'll have to rephrase the question," jokes Frankie. "Do you want the needle in the shoulder?"

Two blinks.

"In the flank?"

One blink.

"Wise decision, Baron. Haunches are heftier."

But joking Frankie is uneasy as he rams the gram payload home. As he leaves the cage area to hang up his labcoat and head home for the weekend, his fugue takes on ominous minors.

Jo-Jo, subtle Jo-Jo, a panther of dark deduction, quick Jo-Jo is unbelieving. "Listen up, Tanker," says Jo-Jo in his identity as Manfred the Animal Trainer, "cats, rats, even the quick-fingered racoon are just animals. Their reactions are visceral. They jump to my voice because I pitch it so as to rattle their bones and jiggle their cartilage. No more than that. No more."

Frankie tries to be firm. "But it's been a week. I even tried Spinoza." It is as difficult to talk to Jo-Jo when he's Manfred as it is to Queenie when she's Anne Sexton. "I read the Baron a chapter on Spinoza from a philosophy textbook, then quizzed him from it. Sixty true/false questions. He answered every one right. Correctly. I tell you, Manfred the Cat Man, that those two hours were worth ten times the 14 Unicreds that the libe charged for running the chapter."

Jo-Jo shakes his head like a lion on a pedestal. "It doesn't compute, Tanker Frank. You can't raise a lower animal. Now, if you were talking gorillas, I might bite, savvy? But rats . . . you're just out to crack my whip."

Only then does it occur to Frankie, open, innocent Frankie, kind Rat King, only then does it occur that perhaps the Baron should be Frankie's secret. Perhaps the rules forbidding outsiders from the cage-rooms of International Control Experiments—MANchester might work to Frankie's benefit. Perhaps . . . Frankie pauses to tuck some Tide Rider between his lip and gum, pauses to mull over the meaning of Von Ronk, to muse on the intelligence behind the sword-tip eyes that glow in the case like indicator lights on the control panel of the incinerator, to muse . . . to muse.

"I said," Jo-Jo interrupts, "I said, are you making the DEN this evening? Will you join me in a glass of the Devil's Dew?"

Frankie shakes his head, no, gentle Frankie needs some lonetime. "Give my regrets to Queenie, whoever she is."

"What if she's Lascivious Lacy, loose woman extraordinaire?"

Frankie shakes his head, slow. "I'll have to take my chances and hope some of Winsome Virginia's reluctance spills over into Queenie's Lacy."

And so Jo-Jo adjusts Manfred's wristlets and says good-bye, leaving Frankie to consider

rats and rat-ness and

intelligence, which leads him to
human-ness, whose nature is

to delay immediate gratification in return for later,
greater gratification, as well as

fire, that was a gift to humans alone.

Frankie takes another pinch of Tide Rider . . . but wait! Before he tucks it under his lip, Frankie considers

delaying his own gratification (to remind himself
that he's human)
and

offering a pinch to Baron Von Ronk if Von Ronk
will first refuse his own food for a day, thereby
proving that the Baron has indeed some
human-ness.

But did it come from #097-34-8435?

Frankie, lightsome Frankie flies his appointed rounds on the wings of new white sneakers, this pair with rats' paws and whiskers inked in black, and rats' eyes inked in red. Frankie has removed Baron Von Ronk to a cage in Frankie's own makeshift office in the supply room, there more easily to converse during lunch breaks, coffee breaks, supply pickups, there to discuss matters as weighty as Spinoza, as light as the disappearance of butterflies from the fields outside COALchester. Frankie finishes his last injection

and removes his last dead rat to the incinerator and skips, trips into his office to discuss the root causes of the Baron's transformation.

"It must be the injections, mustn't it?" he asks without even a hello.

One blink.

"But the mechanism, the mechanism." Frankie shakes his head and pulls from his pocket a vial of Breath of Meth, to sweep his head clear of the day's clutter and tighten up the logic of his mind. "Want a dose?" he asks Von Ronk.

The Baron blinks twice.

"Just as well." Frankie drops a BOM and props his sneakered feet on the case of syringes that serves as his desk. "Now," grunts Frankie, settling himself for a siege of reasoning, "I've been boning on the Metapsych of Learning, cognitive stuff and sense, you ken? And what I've come up with is an engram theory. Now, listen up, my good Baron. #097-34-8435, I discovered, contains trace amounts of a hormonal derivative from the human pituitary (although how they milk a person buggers my mind). Any-the-way, my guess is that the hormonal acts as a template to reproduce the contents of the original human mind, and something else in #097-34-8435 acts like the pencil and traces the engram on the mind of whoever is dosed with the stuff in sufficient quantities, rats included. Rats, my good Baron, rats included. What do you think? Sound possible?"

One blink, after some hesitation, the eyes like traffic lights at the end of the PORTchester tunnel.

"So let's assume that I'm right. Let's assume that the engram of some human being's mind has been imprinted on yours like a logic circuit on an IC chip. It stands to reason," Frankie, clear-eyes Frankie intense under the spell of BOM, the methamphetamine fine-tuning his logic circuits, "it stands to reason that you have a personality, even a name. Do you believe that

you have a name? other than Baron Von Ronk, of course?"

One blink.

"You do?" Frankie brightens in the rosy-glow of being right (and just a little high). "What is it?"

If a rat could show disdain, the baron would. Simply turning his back and munching his Krispies must be enough for the moment.

"I mean, can you spell it?"

Von Ronk turns slowly, blinks once.

"Let's see," Frankie hearkens to his computer-ginned puzzle games back in fifth level math, "is its first letter in the first half of the alphabet?" And Frankie shifts his weight to make himself comfortable for a spell of iteration that yields the name

Ruthie

"Ruthie?" Somehow, Frankie has expected the Baron's human psych to be a male's. Still a psych . . . Psyche . . . at least Frankie's engram theory is alive.

Frankie re-crosses his legs and reaches for a book he brought with him on the morning Transport. "Now, Ruthie, Baroness Von Ronk, we will determine the IQ of the engram. Assuming the transfer of intelligence was complete, we'll also get the original Ruthie's IQ," and Frankie, quizzical Frankie is curious to find what sort of a dumbbroad donates pituitarial hormone.

After two hours of a Scale-One Culturefree True-False IQ test, Frankie jotting and adding on his Klip-board, emerges the figure 168.4.

"Some dumbbroad!" whistles Frankie while Von Ronk waggles Ruthie's head as if to say . . .

but of course he can't.

Weary Frankie calls it a day, stops by the foodery for some No-fix NUTRItubes and a plum, and passes up the DEN for the sixth straight night to spend lonetime at his sleepery, there to consider what's in it all for Frankie . . . only to find that Queenie has let



JAMES E. RAVASIO

herself in and is waiting for him, waiting, clothed in her inimitable Protopsych.

"I'm worried about all your lonetime," she lies. "Despondency doesn't suit you."

"I'm considering leaving the priesthood," Frankie tries to joke. "Share a tube?" He proffers a red Rosepetal Gumbo.

"Don't play cagey, Rat King," Queenie snaps. "You got a sidething?"

Frankie doesn't answer. He snips the cap from a green Limekey Pie and leans back against the doorframe. "How's the AID business?" he swigs. "Broken in any new identities?"

"See me more often and you'd know. Now answer up, King Tut—why the lonetime? Work a drag, or am I?"

"Neither."

"Chemical imbalance? Male menopause?"

Frankie shakes his head and sips green again.

"Rat got your tongue?"

"In a manner of speaking." But Frankie remembers to play it close to the chest. "Punching holes in rats all day calls for an occasional thought on the meaning of life."

"You could do that in the DEN."

"The noise," and Frankie waves a static hand.

"You could do a little mental do, maybe a gram of Abstraction 8 or a slice of Silent Pie."

"The number 8," wan Frankie smiles, "is just a vertical way of writing infinity."

"There you go again," Queenie is about to spill over in anger. Instead, she shifts into the womanly wiles mode, so quickly, so fully, that Frankie can actually see sex shift her hips to one side and stiffen her breasts and dip one shoulder

so that he sets himself against the Lascivious-Lacy spillover

and

the evening ends on the sour sight of Queenie's back as she leaves to seek out her brother.

"Incest? You really think they're into incest alternatives?"

One blink, then two—maybe.

Frankie has been airing to Von Ronk his problems with Queenie—her relationship to Jo-Jo, the limited DEN life, the way Frankie, dancing Frankie makes so few friends—but really all to warm up the baron-nee-Ruthie to the idea of Frankie's dosing himself with #097-34-8435, a grand experiment. Frankie cares little about rumors that AID's of the Green Band or above work out some kinky sex alternates, including Incestuals. He cares less about his own love life than about the ways to proceed with the reality of the rat before him.

Frankie could

turn the whole Matter of Von Ronk over to the

academics and let science take its course, or he could keep the Matter where it stood—a pet curiosity—and falsify the #097-34-8435 record (now tucked under the syringe crate) to read "First dose lethal. Not approved for human consumption or for use where humans may accidentally contact," or he could

dose himself with #097-34-8435, continuing to keep accurate records in case the outcome had wider Meaning for mankind.

So Frankie, gentle Frankie, revered Rat King, sets about in Socratic dialogue with the Baron, question-and-answer, question-and-answer, discovering the truth in a manner unchanged in twenty-six centuries, question-and-answer until . . .

"And if, instead, I dose myself?" Frankie asks as calmly as he can.

Instead of blinking, the baron stands stone still, more still than Frankie has seen him, more still than rat has ever stood.

Frankie asks again. Again, the baron, unmoving, unblinking.

"Are you all right?"

One blink.

"Are you not answering because you don't have an answer?"

Two blinks.

"Why won't you answer?" Frankie stands, rephrases, "Is the answer too qualified for a simple yes or no?"

Two blinks.

"If not too qualified, too awful?"

One blink.

Frankie, sophisticated syncopated Frankie, dread Rat King, pauses. Pauses just for a moment, brave, sophisticated Frankie, then asks, "Death?"

Two blinks.

"Disease?"

Two blinks.

Frankie lifts the light cage by the handle and walks with the baron the length of the storeroom, and back. Shades of the Good Greek, peripatetic Frankie.

"Awful, huh? Do you want to stand by your answer?"

One blink.

"And you're one-hundred-plus sure of your comeback?"

Two blinks.

"Ah. Doubt. Doubt assails the good Baron. Doubt is the human condition, you know. We live immersed in a sea of doubts, eh, good Baron?"

One blink.

"I might take #097-34-8435 and emerge all right?"

One blink, then two.

"And I might even emerge as superman, Ubermensch, savvy, good Baron?"

One blink, then two.

"Who are we?" Frankie, nervous dancing Frankie, creator of the dance step known in his select circle as the Hitch-Kick Hip Trip, Frankie avoids returning to the heart of the question and instead philosophizes. "We are shaped by the outlines of the unknown. When we push at the boundaries of what is sure, the edges of the not-sure push back. The print of our fingers is on the unknown, and the print of the unknown is on our fingers." Frankie waves his free hand in front of the baron, who crouches unblinking in the swaying cage. "Behold—even the opposed thumbs of the human animal cannot help him clutch doubt, and crush it." Frankie closes his hand to a fist.

"But it is our nature," Frankie turns at the edge of the storeroom, "it is a part of us to push at the boundaries just the same. We close our eyes to doubt, convert it to sure judgment, and act. It is by acting in the face of our doubts, in the very teeth of the unknown and the untested, that we learn who we are."

Frankie stops at the crate of syringes and sets the baron atop it once more. "I've decided," he tells the baron who is now, mentally, the woman Ruthie, "and I'm sure you know what I've decided."

The rat Von Ronk waves his head from side to side, then abruptly bumps his face against one wall of the cage. Slowly, Von Ronk-nee-Ruthie turns and, one by one, in increasing violence, bumps against the other three walls, then huddles unblinking in the corner opposite his food tube.

Frankie leaves, in order to take one quick dip into the night before tomorrow, when he will dose himself, vein at the left elbow, with #097-34-8435, despite the warning of the rat Von Ronk, despite the warning and the doubt.

"You're quiet, gentle Frank," observes Jo-Jo the Black Box Prince. "Rat got your tongue?" His tone is itself gentle, for in the months since Frankie injected himself with #097-34-8435 Jo-Jo has graduated to the Ultraviolet Band and is (for the moment) ensconced in his Superidentity as Jusef the Mastershrink, the ultimate black-box man who seeks from the outside human face the mysteries of the inside human mind.

Frankie nods.

"Do you miss your rat friends?"

Frankie nods.

Jo-Jo Jusef wags his head slowly. "I'm sad for you, gentle Franklin. I only wish that I'd achieved UV earlier and that you could have consulted me, before . . ." More slow wagging head in the back, black cubic of the DEN, the music from the dancefloor swallowed by the yards and yards of floorfizz between.

"Myths," continues Jusef in the low, gentle modulation, "myths are the stuff of the Mastershrink's trade, because myths are the inside made outside. You remember the genial gloved gentlebeing who,"

intoning,

"to make the
inside, skin inside outside
put the outside fur side
inside?"

Frankie nods.

"But when we *become* our myths, when we *are* myth—when, that is, we have drunk from the Klein bottle—we are changed unalterably, out and in. In the words of our racist forebears,

once you go black
you never go back."

Frankie nods.

"So," palms up in the ancient gesture of helplessness, a gesture that, like tears, is lost on the unseeing Frankie, "so . . . the fate of Tiresias."

Frankie, still Frankie, speaks at last. "The baron had suffered the same fate, and tried to warn me. I didn't understand. I wouldn't listen. Pride," Frankie makes a gesture with his palms that accidentally mimics Jusef's.

"Pride is both sin and salvation," observes Jusef.

Frankie, wan Frankie stiffens himself just a bit. "And blindness is both punishment and reward."

"In a way I envy you," admist Jo-Jo, a prince always. "You know woman-ness."

"And I know myself."

"It is given, and it is taken away."

And Frankie, blind Frankie, his eyes, like the Baron's, now good only for blinking, slips into a DEN reverie of the electric nighttime alive with the polychromatic polymers of possibility, with the electric eclectic maybes of viscera and vicissitude, alive with the elasticity of the black beyond, aware of himself, of his man-ness and his woman-ness, aware

that it was worth it.

—G.E. Coggshall





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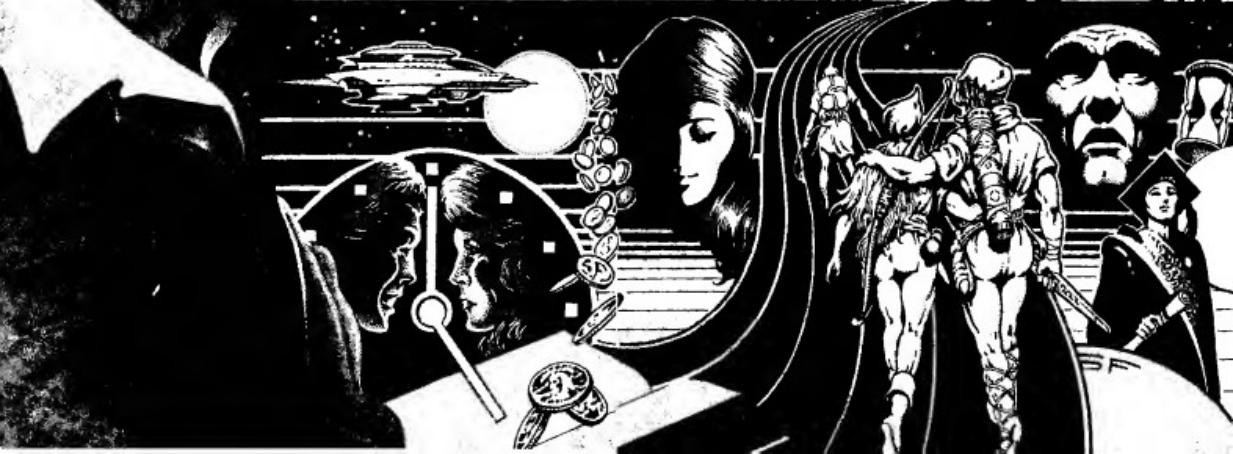
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